North Carolina Highway Bulletin

VOL. IV SEPTEMBER, 1923 No. 7

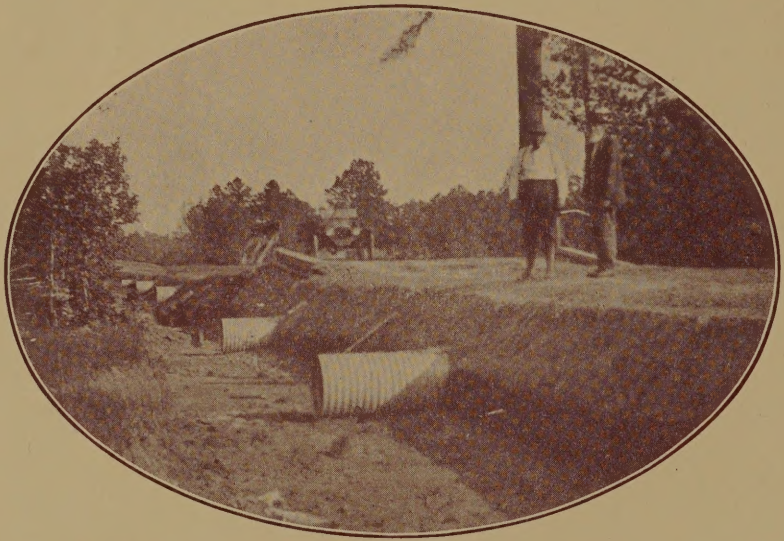
SCENE ON BOONE TRAIL HIGHWAY—ROUTE 60

NEWPORT CULVERT COMPANY

OF

NEWPORT, KENTUCKY

THE OLD RELIABLE
"GENUINE OPEN HEARTH IRON"
CULVERT



For the convenience of our
local customers we carry
a large stock in Raleigh.

J. H. SLAUGHTER

State Representative

Office and Storage Yards Corner Mountford and Lenoir Streets

PHONE 2424

NORTH CAROLINA HIGHWAY BULLETIN

VOL. IV, NO. 7 H. K. WITHERSPOON, Editor September, 1923

Canton-Waynesville Road Being Hard-surfaced

By E. L. Allen, *Resident Engineer*

PROJECT 944 is that part of route No. 10 which extends from a point one mile West of Canton in a westerly direction down the Pigeon River Valley, a distance of 10.18 miles to Waynesville, N. C. It is a Federal Aid Project, being old No. 16 reopened.

Before going further it might be well to consider a few interesting facts about the country through which it runs. It is in the ''Land of the Sky,'' the lowest elevation on it being 2,730 feet above the sea level. At Canton, on the east end, is located the plant of the Champion Fiber Company. The second largest plant of its kind in the world. At Lake Junaluska, which is about the middle of the project, is the assembly ground of the M. E. Church, South, where thousands of visitors come each Summer. At Waynesville, on the west end, one finds a progressive town of 2,100 population, which also attracts numbers of tourists.

The amount of traffic this part of Route 10 handles is at present 77 trucks, 450 passenger cars and 25 wagons. This makes a total of 552 vehicles per day through the months of July, August and September. This is actual count on a week day from 6 A. M. to 9 P. M.

This project presents an ideal example of the progressive type of road. The present road is of gravel and is 16 feet wide. Its alignment and grades are such that practically all of it will be used. This gravel is about nine inches deep and will form an excellent base for the new pavement. In building this road terra cotta pipe, dry rubble boxes, a few concrete culverts and three R. C. Slab Top Bridges were used as drainage structures. The three bridges are to be retained. All of the terra cotta pipe and dry rubble boxes are to be replaced with reinforced concrete pipe. In quite a few cases it has been found necessary to replace the old concrete culverts with reinforced concrete culverts. This is due to their being too small to care for the water, and also, that some of them are just ready to fall to pieces. They were built of concrete made of gravel using local sand with no reinforcing steel except in the top where a few pieces of random sizes were used.

The new road being built is 30 feet both in cuts and fill. Pavement is to be 5-inch 1-2½-5 concrete base with 12-inch headers; wearing surface is 2 inches of asphaltic concrete, width of pavement is 18 feet; pavement is to be curved top and bottom, except on super-elevated curves where the same concrete area is to be kept with a flat surface.

Grading is light, principally borrow and averages about 4,000 cubic yards per mile.

The old road was too narrow to take the new pavement and had to be widened. It also has too much crown. In order to take care of this the new subgrade line has been laid four-tenths of a foot in the gravel. This four-tenths is to be pulled to each side in order to make a uniform bearing surface for the extra foot width of pavement on each side of the old gravel pavement. The whole width is to be sacrificed and rolled with a ten ton roller before any pavement is placed

In the widening of present embankments the slopes are being furrowed with a plow before new dirt is placed. Special care being taken not to plow down any of the embankment which will be beneath the new pavement. New embankments are being made in 12-inch layers and each layer rolled with a two ton ringed roller.

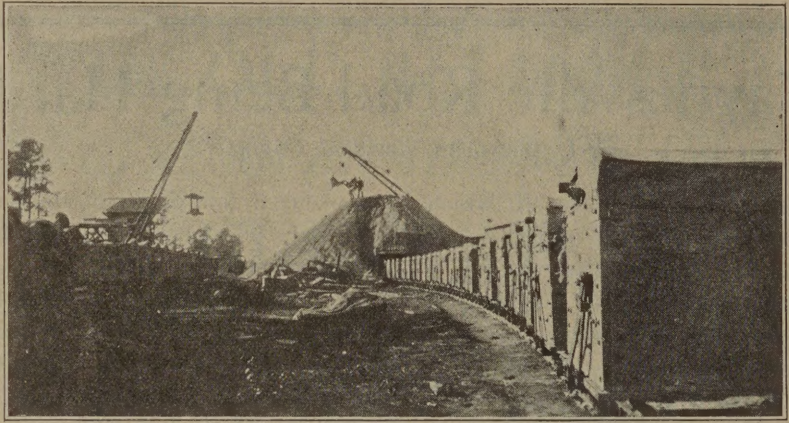
The average curvature per mile is 210 degrees. The maximum curve is 109 feet radius of which there is only one, and it is in the town of Waynesville. The minimum curve is three degrees. The total length of the 55 curves is 2¼ miles. The length of the longest curve is 600 feet. The length of the longest tangent is 2,640 feet. All curves with radii below 300 feet are to be super-elevated at the rate of one inch per foot. and widened on the inside according to the North Carolina Highway standard. All curves with radii between 300 and 900 feet are to be elevated at the rate of ¼ of an inch per foot.

(Continued on page 13)

Building Concrete Road *on a* Large Scale

By C. V. Baker, *Resident Engineer*

WITH the coming of hot weather in June, and the arrival of the musical mosquito, the folks who live near the sea start overland to the mountains. Likewise, when treated to the same weather and whatever insect that bites in that section, the folks in the foot-hills and the mountains journey to the sea. This universal desire to get away from home creates quite a bit of traffic on what is now known as the Charlotte-Wilmington-Asheville Highway, Route No. 20. Not so many years ago this route was good for a few miles out of Charlotte and Asheville and after crossing the ferry in Wilmington. The remainder, with exception of that traversing one or two counties, was rough going. In places it was almost impassable red clay or sand beds, depending on which section of the State you were in. But things have changed now. The work of the maintenance department, and several miles newly constructed, has made the route a boulevard compared to former conditions.



Loading Plant, Showing Tunnel for Sand and Stone

Project No. 386-87 is a part of this route from the mountains to the sea. Beginning at the eastern limits of Maxton, it traverses the county of Robeson, oftentimes referred to as the "State of Robeson" on account of being the largest county in the State and one of, if not the richest, in agriculture of any of our counties, over half its length, for a distance of 19.08 miles, passes through the town of Pembroke, in whose vicinity are 7,000 Indians, said to be the descendants of the people from the Lost Colony, and ends three and one-half miles west of Lumberton. With the three and one-half miles laid last year west of Lumberton and the seven miles nearing completion between Maxton and Laurinburg, this project will complete a thirty mile stretch of concrete roadway. The public is already enjoying the use of seventeen miles of this, most of which has been recently opened to traffic.

The Finished Road

The country through which this road passes is generally flat and sandy, dotted with swamps, but is very fertile, producing magnificent crops of cotton, corn and tobacco. It is for the most part under cultivation, having been made suitable for farming in recent years by extensive drainage operations. But for these extensive drainage operations that have been completed by the various drainage districts along the highway, the drainage problem, which is one of the largest encountered when building roads in Eastern North Carolina, would have been of much greater magnitude. Owing to the level nature of the country traversed, there are no unusual features of location, with the possible exception of a 4.5 miles tangent. Practically all grades are very light, and it was possible to utilize long stretches of the old sand-clay road built by the county where its location permitted. Wherever the highway followed the old road the new grades were laid as near as practicable to the existing grades in order to utilize the old compacted surface for new subgrade upon which to lay the concrete.

The entire project, including structures, was let July 25, 1922, to James O. Heyworth, general contractor, Chicago, Ill. The grading was sub-let to the Robeson Construction Company of Lumberton, N. C. The total cost of the project is approximately $588,625.00. It consists of 200,600 square yards of paving, one 400′ and one 50′ reinforced deck girder bridges, eight reinforced concrete culverts, and 101, 200 cu. yds. of excavation. At the time of letting this was the longest project in the State and is at the present time the longest stretch of concrete let as one project in one District by several miles. Its length is exceeded by only one concrete project in the State, and that only by a fraction of a mile, when recently a project was let in the 1st and 2nd District jointly.

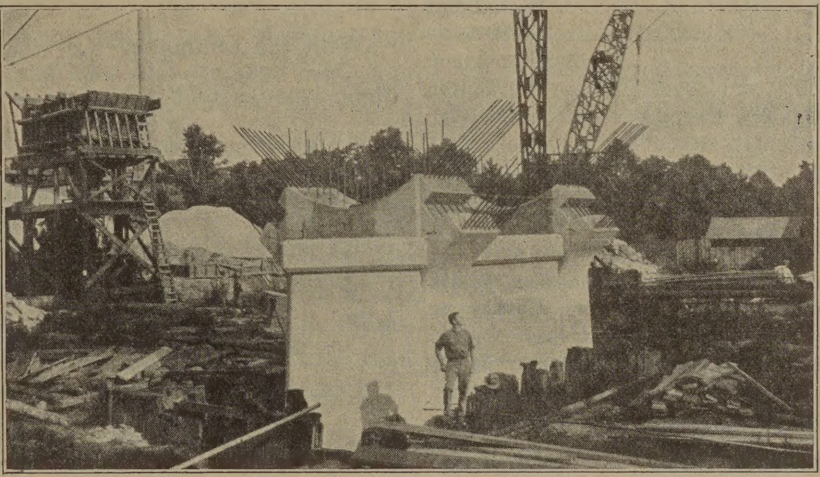
The contractor started operations on July 17, 1922, when work was begun unloading equipment and erecting a material plant. The equipment consists of: one Industrial crane, one 32E Kohring paver, one P & H 10-ton crane, one Lakewood finishing machine, one 10-ton gas roller, one sub-grader, 2,000 linear feet Heltzel forms, 140 Western batch boxes and trucks, 6 Whitcomb and Plymouth locomotives, 10 miles of narrow gauge track, one pile driver, and one road machine. The plant is located at Pembroke, making a haul of nine miles one way and ten the other. The industrial system is used

(Continued on page 23)

Project No. 673—Yadkin River Bridge

ANOTHER link on one of the State's main highways is being rapidly completed and long before the entire route is paved the Yadkin River bridge will be carrying traffic from the eastern part of the State to the west over Route 10. Construction work was started on this project February 7, 1923, by the Hardaway Contracting Company of Charlotte, N. C., and Columbus, Ga., and has advanced since until estimates show the project about 30 per cent complete.

Consisting of seven reinforced concrete arches, each of 150′ 0″ span, with two 40′ 0″ deck girder approach spans on either end, the bridge has an overall length of 1300′ 0″, with a roadway of 20′ 0″ between curbs. It spans the Yadkin River at a point about five and one-half miles east of Salisbury toward Lexington, near the town of Yadkin, N. C., on Route 10. At present, traffic is served at this place by a toll bridge, owned and operated by a private stock company, receipts from same having reached the sum of $215.00 per day with heavy traffic. The toll bridge has only a 12′ 0″ roadway and hence serves only as a single track bridge, inconveniencing traffic considerably The approaches to it are also bad, being down a steep grade on the Rowan County side, and then the river bottom which is flooded during ordinary high water renders same impassable on the Davidson County side.



SHOWING DESIGN AND REINFORCEMENT IN PIER

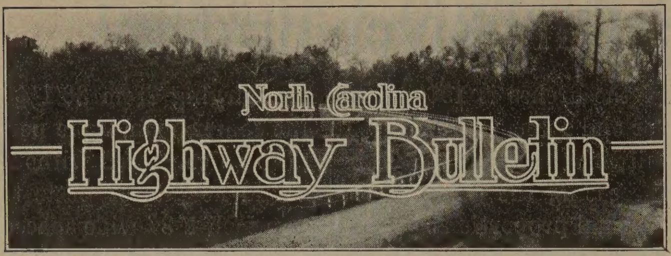
The new location carries the road across the river from Rowan County to Davidson County on practically a level grade. The approach on the Rowan county side is a tangent, the grade being 3.4 per cent for a distance of 200 feet, while on the Davidson County side the road leaves the bridge on an easy curve and rises on about a 3 per cent grade for 2,000 feet. The grade line of the bridge rises from elevation 413.0 at the end to elevation 415.25 in the center, being distributed parabolically to add to the appearance of the structure and also providing drainage for the roadway. Normal water level is at elevation 360.0; maximum high water level elevation 380.5. The springing lines of the arches are all level, set at elevation 378.0 to place the structure well above the level of the backwater of a proposed plan to be built lower down the river at some future date.

The arches are of the open spandrel ribbed type, being similar in construction to those built over the Yadkin River on Swift Island Ferry Bridge. The clear span of the arches is 150′ 0″, the rise varying from 30′1½″ for end spans to 31′ $4\frac{3}{16}$″ for the center span, same permitting the grade of the bridge to be cambered without increasing the depth of beams and heights of posts to unusual proportions. The ribs are each 4′ 3″ wide spaced 12′ 0″ apart, braced by beams and struts at intervals. Crown thickness is 2′ 6″, while the thickness at the springing line is 4′ 6″. Each rib carries sufficient reinforcement to take all live load and temperature stresses, having nine rows of bars in both top and bottom with stirrups at 4′ 0″ centers. The roadway slab is a deck girder design, having 3 girders continuous over 3 spans, each about 16′ 6″, construction joints thus appearing at the face of each pier and at the one-third points over the arches.

For the seven arch spans there are eight main piers, each 10′ along center line of roadway at the springing line elevation. These piers are battered ½ inch to the foot on each face. Unlike the piers of the Swift Island Ferry Bridge which are of the round nose type, and are hollow between the ribs, these piers have pointed noses and are built solid up to the springing line. Copings are built 2′ above the springing line of the arches to keep same well above the proposed pond level, which will be maintained in later years.

Plans call for foundations for all piers to be carried from two to three feet into solid rock. To date seven of the eight piers have been built and all were securely founded on hard granite. Three of the piers, Nos. 5, 6, and 7 are in the river and foundation was secured by placing a standard puddle cofferdam, clay chamber being nine feet wide. Cofferdam frames were built on the bank of three lines of 6″ x 8″ timbers spaced four feet apart and carried to place by the cableway. The water varies in depth from 3′ to 6′ and an unusually dry cofferdam was secured since the river bed is practically all solid rock at this point, very few boulders being encountered. Pier No. 8 is on the north bank, or Davidson County side and being above the river, level was secured without any trouble whatever. Piers Nos. 2 and 3 are in the river bottom on the south bank, or Rowan County side, and for these Wakefield sheet piling made of three 2″ x 12″ timbers 16′ 0″ long were driven to rock, excavation being carried on inside of the frames thus

(Continued on page 13)



Published Monthly by
NORTH CAROLINA STATE HIGHWAY COMMISSION
Raleigh, North Carolina

COMMISSION

Frank Page, *Chairman*	Raleigh
J. E. Cameron	Kinston
J. G. Stikeleather	Asheville
W. A. Hart	Tarboro
W. A. McGirt	Wilmington
John Sprunt Hill	Durham
J. Elwood Cox	High Point
W. C. Wilkinson	Charlotte
A. S. Hanes	Winston-Salem
A. M. Kistler	Morganton
Chas. M. Upham, *State Highway Engineer*	Raleigh

Address all communications in regard to Bulletin to the editor, Box 1140, Raleigh, N. C.

This Bulletin will be sent gratis to any State or county official, contractor, newspaper, trade publication, library, or other person interested in the improvement of roads and in the work of the Commission. Advertising rates may be obtained on application.

Volume V **September, 1923** **Number 7**

Table of Contents

⁂

	PAGE
Canton-Waynesville Road Being Hard-Surfaced	3
Building Concrete Road on a Large Scale	4
Project No. 673—Yadkin River Project	5
Editorial	6
Contracts Awarded August 29th	7
Good Roads are Worth Their Cost	7
Conquering a Sea of Sand	8
Asheville-Hickory Nut Gap Road Under Construction	9
Project 980—Macon-Swain Counties	10
Laurinburg-Maxton Road Being Paved	11
Project 856 and 860 Under Construction	12
Saturation Point is not in Sight	16
American Road Builders Association	16

Editorial

⁂

The next letting of State highway work is scheduled to take place on October 10th, when bids will be opened on approximately twelve projects.

⁂

The cover sheet this month shows another reason for "seeing North Carolina first." The scenery along route No. 60, between North Wilkesboro and Boone is some of the most picturesque in the State.

⁂

With the coming of Fall the tourists are beginning their journey to Florida. Large numbers pass through this State every day and all are enthusiastic over the condition of North Carolina roads—all of which goes to advertise the State.

⁂

Pamphlets containing ordinances governing the use of State Highways may be secured from any of the district offices or from the Editor. These ordinances have also been published in poster form and will be displayed in all public places. Motorists should secure copies of this law and become thoroughly familiar with the provisions as they will be strictly enforced.

⁂

Some criticism of the State Highway map has been noted by reason of some of the roads being shown hard-surfaced when they are still under construction. It is obviously impracticable to publish a new edition of the map each month and for this reason the information is shown somewhat in advance. However, information regarding the condition of any route in the State, the detours, etc., may be had by addressing the Editor.

Contracts Awarded August 29th

NINETY-FOUR bids were received on twelve of the thirteen projects advertised for letting on August 29th, and awards were made on ten of the twelve projects upon which bids were received. No bids were received on the single project advertised from the Third District. This letting brings the roadwork undertaken by the Commission since its organization to a total of 3,393 miles and a total investment of approximately $61,176,000; this figure including all Federal Aid funds and money advanced by counties.

The following awards were made on bids opened August 29th.

Project 108, Bertie County, consists of placing creosoted sheet piling around the ends of the fills on Federal Aid Project No. 86-B, and was awarded to E. T. Gwathmey, of Norfolk, Va., the estimated cost of the work being $13,481.86.

Project 180, Perquimans County, was awarded to Smith Bros., of Dallas, Texas. The work consists of 9.96 miles of road on Route 342, between Hertford and Woodville, which will be graded and surfaced with plain concrete, at an estimated cost, including structures, of $247,160.

No bids were received on Project 352, being 2.31 miles of paving between Wilmington and Leland on Route 20.

J. A. Marrow, of Clarksville, Va., was awarded the contract for the roadway and structures on Project 421, Franklin County, 9.23 miles of road between the Wake County line and Franklinton. For the present the road will be graded only, and hard surfaced at a later date. The work, as let, is estimated to cost $61,012.

Project 495, Warren County, was also let to J. A. Marrow. This work is located on Route 50, between Norlina and the Virginia State line, a distance of 7.96 miles. The contract calls for grading, topsoil surfacing, and structures at an estimated cost of $71,000.

Zeigler & Dalton, of Junction City, Kansas, newcomers to North Carolina, were awarded the paving on Project 507, Alamance County, 4.03 miles on Route 62, between Graham and the Randolph County line. The grading on this project was done as a part of Project 502; so bids were asked only on the paving, which will be plain concrete and will cost in round figures $122,000.

The above firm was also successful bidder on Project 592, Rockingham County, 8.2 miles on Route 70, between Greensboro and Reidsville. The contract calls for grading, and paving with plain concrete. J. L. Brinkley, of Thomasville, was awarded the structures on the same job. The total cost of construction is esimated to be $310,108.

Bids were rejected on Project 641, Iredell County, 8.04 miles between Statesville and Harmony.

Project 679, Scotland County, a bridge on Route 20, between Rockingham and Laurinburg, was awarded to E. T. Gwathmey, of Norfolk, Va., the estimated cost of construction being $16,885.

Projects 611 and 697-A, Anson-Union Counties, which were combined for letting, were awarded to Jas. O. Heyworth, of Chicago, Ill., for grading, draining, and paving with plain concrete. The work consists of 12.44 miles on Route 20, between Monroe and Polkton.

Bids were rejected on Project 745, Forsyth County, 4.57 miles on Route 64, between Winston-Salem and Lexington.

The road work on Project 902, Buncombe County, 4.95 miles on Route 10 between Asheville and Waynesville was awarded to the Wilson Construction Company, of Rutherfordton, N. C., for grading and plain concrete paving.

The structures on the same project were let to R. G. Rand, of East Flat Rock, N. C. The total estimated cost of construction is $236,755.

Conquering *a* Sea *of* Sand

By A. L. CORNELL, JR. and G. B. COOPER, *Resident Engineers*

BEGINNING at Wilmington and running in a northeasterly direction through the towns of Jacksonville, New Bern, Washington, Williamston and Gatesville to the Virginia line, that portion of the State Highway System known as Route 30 presents many interesting features of highway construction, of which the first 50 miles, known as the Wilmington and Jacksonville Highway, will be dealt with in this article.

Pender and Onslow counties traversed by this Highway are situated in the extreme southeastern part of the State bordering on the Atlantic Ocean and by reason of this location are very sandy and poorly drained. This territory is sparsely settled owing to the difficulties of transportation which the construction of this road will relieve in a large part. This section of the State was settled at an early date by people from the New Bern section on the north and from the Cape Fear Plantations on the south, who were probably attracted by the wonderful resources of the territory in the way of fish, oysters and game and also the great forests of virgin timber which at that date covered the whole coastal plain.

The road practically parallels the coast line at a distance of 3 to 5 miles or just far enough back to avoid the heads of numerous creeks and bays that jut out from the Sounds along the coast. These bays and creeks are filled with fish and oysters, and in winter are the feeding grounds of thousands of wild duck and geese. These together with numerous deer that roam the back woods make this section a veritable "Sportsman's Paradise," which the completion of this road will open up to the hunters and fishermen of this and other states. In this connection it would be a good idea for the State and county authorities to take steps to see that this game is not slaughtered as ruthlessly as the timber resources have been. The way the timber of this region has been cut is a blot on our whole State. For mile after mile the road runs through cut-over land that judging from the stumps was a wonderful growth

was no semblance of a road, the "Highway" being merely a sandy trail impassable a major portion of the time.

Construction was started in November, 1921, the first project being 15.56 miles in length and known as Number 375. This contract covered grading, structures and artificial sand-clay surfacing. Owing to the scarcity of clay, however, this surfacing was abandoned on February 15, 1922. The clay surfacing would have proven far too costly for the result obtained as the clay was of an inferior quality and had to be hauled excessive distances.

Contracts were let in rapid succession for the grading and structures on the balance of the road to Jacksonville. This was let in two projects, No. 364-A and 364-B, successively.

Owing to the extremely sandy soil the graded road would have proven but little better than the original trail. In the light of this, investigations were started immediately to select a type of surfacing that could be quickly and cheaply built. A type of pavement known as sand asphalt was suggested. Tests were made of several sand deposits adjacent to the Highway. The result of these tests were encouraging and in the early Spring of 1922 a location was adopted and a portable asphalt plant was ordered. A project 10 miles long, beginning at Scott's Hill and known as 379 was to be constructed and as this project was to be considered an experiment no bids were invited. Accordingly a Superintendent was employed and an organization perfected by the Highway Commission.

The plant arrived the latter part of March and the first asphalt was laid in May. The work proved satisfactory from the beginning and it was decided to continue this type of construction to Jacksonville. The plant was moved during March of this year, 13 miles further toward Jacksonville and in order to expedite the work another plant was ordered about the same

Asheville-Hickory Nut Gap Road Under Construction

By E. L. Kemper, *Resident Engineer*

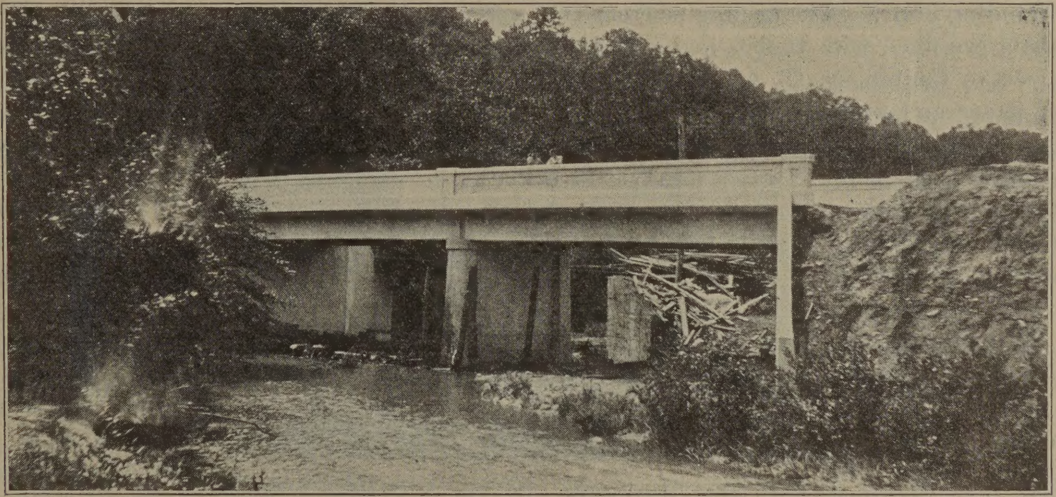
BY THE END of the working season in 1923 Project 901 will be completed except for the last mile of concrete at Hickory Nut Gap, the boundary line between Buncombe and Henderson counties.

A. J. Wardrep, the contractor on this project started the grading during December, 1922 and in June, 1923, after he had completed the grading on about three or four miles he brought in a concrete paving outfit, capable of laying between five and six hundred feet of finished concrete pavement a day, and started laying the pavement.

The bridges on this project were built by R. C. Stevens and he handled his work in such way that they were all completed and out of the way ahead of the paving outfit.

The contractor decided to lay the first three miles then by building a thousand feet of dirt road, one bridge and using a half mile of the old road to jump over this section and take the next two miles, always working towards the material. This would complete the five miles from the foot of Hickory Nut Mountain to the present hard surface road leading into Asheville. This five miles has very little grade and hardly any curvature, there being only thirteen curves in the five miles, ten of which are six degree and under, and the other three, between six and eighteen degree curves.

The last two and a half miles of the project is a steady climb to Hickory Nut Gap on an average 5% grade with a great deal of curvature, the extra width pavement amounting to approximately 8% of the total for the two miles and a half. All of the curves are of the standard radius of 89 feet or over and have the necessary distance between curves as required by the sheet of standards for transition curves. This section with the heavy curves with extra width and super-elevation on a steady grade is going to be a difficult piece of work to get a good finish true to grade and the contractor will necessarily have to go slow and steady if he gets a good job.



Bridge Over Rocky Broad River—Project 901

Owing to the location of this project it is an extremely difficult one to pave. All the material has to come in from the west end and the nearest shipping point is five miles from the beginning of the project. This means a long haul over the old paved road and a good deal of jumping around to cut down the long haul over the newly graded road which in the mountains, owing to the frequent heavy rains, is a thing to be avoided.

In January the contractor opened up a quarry one mile from the beginning of the project where he crushed enough stone and screenings to lay between four and five miles of pavement. This material is now being loaded in the trucks from a Blaw-Knox Batcher Plant, having four compartments, two for stone and two for screenings. The trucks which haul two five sack batches each start from this point and are loaded with the stone and screenings for two batches in twenty seconds. They then go to the beginning of the project where they pick up the sand which is loaded by hand. The cement is hauled in separate trucks to the mixer and is put direct in the hopper.

It will be almost impossible to get the whole two miles and a half graded in time to finish the pavement this season and, therefore, it is the intention of the contractor to grade the first mile and a half at once and haul all the sand and cement up on the mountain while he is working on the first five miles. The stone will come from a quarry which he has opened at the top of the mountain. This will permit him to lay the concrete up grade instead of down and have that much more chance of getting a good job.

Project 980—Macon-Swain Counties

By J. C. Dean, *Resident Engineer*

PROJECT 980 is a link in Highway 10 which runs from Beaufort County in Eastern North Carolina to Murphy, North Carolina and the Georgia line. It has been given the name of "Old Hickory Highway," in honor of the 30th Division. Project 980 begins at Topton, North Carolina, station 409-78 and ends at Almond, North Carolina, a distance of seventeen miles, and is a continuation of the road from Murphy to Asheville.

Topton, N. C., the beginning of Project 980 has an elevation of 3100 feet, and with the modern improvements which will be possible when this highway is finished, would make an ideal spot for a summer resort. The highway drops down the Nantahala gorge to Nantahala. (Nantahala is a name given by the Cherokee Indians and means, "Land of the Noonday Sun"). From Topton to Nantahala stretches of 6 per cent grade are required to reach the river valley. Branching out from the highway at this point is a road to Briertown, called, "The Winding Stair." The mountains from Topton to Nantahala are filled with timber and acid wood, which is shipped to Canton, N. C., which is the home of the largest paper and pulp manufacturing plant in the world. The road from Topton to Nantahala has heretofore been passable only for ox wagons and sleds and traveling even in this fashion is extremely difficult. With the completion of the highway now in process, the greatest difficulty, which for so long has held up progress in this section of the State, will be overcome. Good roads are absolutely essential to the development of this community, and with them will come an enhancement in the value of the land, an increase in the output of timber products, and a decrease in freight rates will result, no doubt, due to an increase in the regularity of exports.

In the "Nantahala" County Near Project 980

The highway from Nantahala to Hewitts crosses the Nantahala river, but follows all the way along the river. The property at and near Hewitts is very valuable, Hewitts being the home of the North Carolina Talc and Mining Company. The property of this Company consists of 8,200 acres of valuable timber and mineral lands, containing several million feet of hardwood timber and a large quantity of marble, stone, talc, and other minerals. The Southern Railway and the Nantahala river pass through these lands. The river has a large volume of water and contains a large fall from one end of the property to the other, thus making a great amount of potential water power. The marble on this property is in various colors including white, black, pink, blue, green and other tints. The possible industries of this section will be greatly benefited by this highway, by bringing it into more direct communication with cities.

From Nantahala to Wesser Creek, a distance of seven miles there has been no road for the past fifty years, the railroad having about fifty years ago, used a portion of the original county road or trail for its present roadbed. No attempt has since been made by the county to construct another road through this section. To reach Nantahala from Wesser Creek it has been necessary to drive around by Franklin, N. C., a distance of about seventy-five miles, a half day's journey by auto, whereas it should take only a few minutes. The highway will save the inhabitants of this community a great deal of time and energy.

From Wesser Creek to Almond, the highway goes up Wesser Creek, follows a tributary of Wesser Creek, crosses the mountain in a gap called "Sheep Stump," and comes down the mountain striking "Sallie's Branch," which it follows to Almond. Here it joins the highway to Bryson City, formerly a county highway that has been taken over and is maintained by the State.

The highway from Topton to Almond is being constructed through one of the roughest, if not the roughest, mountain sections in the State. In many places the highway is cut through solid rock, and the progress of the work is frequently delayed by mountain slides. The highway is being constructed of water bound macadam at a cost to the State of one-third of a million. When completed it will be one of the most beautiful scenic highways in Western North Carolina.

At places along this highway camp sites may be suitably chosen and developed for the convenience of the public, for all along the way fuel wood and spring water about, surrounded by the beauties of nature. All the pleasures which have for their bases a love for the out-of-doors,—fishing, hunting, tramping, motoring, and camping,—will be made possible for those who are forced to live in the city for the greater portion of the year.

This highway will make possible many modern conveniences heretofore unknown to the mountain folk, the automobile, telephone, telegraph, and the almost immediate services of a physician. In places along the highway from Topton to Almond it would take hours for a physician to reach a patient. The highway will make possible all the conveniences which serve to take the harshness out of life.

(Continued on page 15)

Laurinburg-Maxton Road Being Paved

BY P. A. JENNS, *Resident Engineer*

OUT of funds supplied by the State Automobile and Gasoline Tax a portion of State Highway No. 20 between Laurinburg and Maxton, Scotland and Robeson counties, is being replaced on a new and shorter route by a hard sufaced, concrete road known as State Project No. 677.

The project is not long, with no difficult engineering features, but has been of unusual interest on account of the sand sub-grade and the necessity of building fills from this unsuitable material.

The contract for grading and paving was awarded to P. R. Ashby of Raleigh and was signed on April 26, 1922. This contract calls for plain and reinforced concrete, types "G" and "G. R." 6:8:6 and 6:6:6 sections, but later, on account of the difficuty of getting a suitable supply of gravel these types were changed to "F" and "F. R." 6:8:6 and 6:6:6 sections 18 feet wide. Contract for structures was let to Chitwood & Palmer of Florence, South Carolina, and was signed on April 24, 1922. These contractors, however, became involved in financial difficulties and their bonding company turned the contract over to General Ditch and Drainage Company of Columbia, S. C., who, at present, are completing the last bridge across Shoe Heel Creek.

GRADING

The contractor's grading outfit consists of 34 mules and 14 wheel srapers, and the whole amount of rough grading consisting of approximately 87,000 yards borrow and common excavation was moved with this outfit by December 30, 1922. The fine grading being done and kept at a distance of about 1,000 feet ahead of the mixer.

The fills were built up in horizontal layers not over 2 feet thick, mule drivers being made to travel on all parts as it was being built and not in ruts. On account of the re-location and impossibility of getting a 10-ton roller through the swamps, also the varied opinions as to the benefit of rolling loose, dry sand, the Engineering Department permitted the contractor to discontinue the use of a roller, but with the understanding that no concrete could be poured across a fill for a least five months to allow of a thorough settlement. At the present date no cracks have shown in the pavement due to fill settlement.

MATERIAL

The cement used on Project 677 has been supplied the contractor by the State, and has been thoroughly tested by the State Highway Testing Department, arriving on the job in carload lots sealed by a State Inspector at point of shipment and the seal broken on the job by a State Inspector or representative, and again inspected by a trained inspector just before mixing.

The coarse aggregate for types "G" and "G-R" concrete was supplied by the Bonsal Company from Lilesville, and consisted of a clean quartzite gravel ranging in size from ⅜ to 2¾ x 4″. The crushed stone for types "F" and "F-R" concrete was supplied by the Weston & Brooker Company of Columbia, S. C., and consisted of a hard, durable granite ranging in size from ⅜ to 2½, and a very satisfactory product.

The sand used was supplied from the pits located at Lilesville, West End, and Carthage, and consisted of a hard, clean sand thoroughly tested by the State Testing Department, and inspected by State Inspectors before using.

Except in a few instances the fine and coarse aggregate have been unloaded direct from the railway cars into the partitioned dump carts, with an average haul of about 1500 feet; cement being dumped into the skips at the mixer and allowed to mix 1½ minutes, timed by a batch meter.

Ashby's paving equipment consists of one No. 14E Rex Paver equipped with water and batch meter; one 10-ton Roller; 1 Barber Green loader; 14 dump carts and mules; 1,000 feet Heltzel Forms; 5,000 feet 3″ water pipe and gas pump; and the necessary small equipment in compliance with the State Specifications, such as 1 21-foot steel screed; 1 6-foot hand roller and belt, burlap, planks, water hose, etc.

OPERATION

After the fine grading had been completed, the sub-grade is rolled, forms set, and usually kept about 200 feet ahead of the mixer. After the forms are set the sub-grade is moistened and rolled again. On account of the sandy condition of the soil, and material wagons cutting up the prepared sub-grade, enough planks are laid ahead of the mixer to warrant a days' run.

At first the contractors thought these planks would be of no great advantage, but since have found them to be of economical value, in so much that a saving of time has been effected by their use, and the small expense necessary to lay these planks, balanced by keeping the mixer in operation longer, wear and tear on the carts, and temper of men and mules. The drivers make better time in arriving, depositing and getting away from the skip, and a large expense is also saved in re-preparation of sub-grade before depositing the concrete.

Four laborers with square-nosed shovels roughly distribute and level off while two others strike off with a 400℔ steel screed board to the required crown, and rolled with a 90℔ roller at least 4 times. It is then belted with a 10″ rubber belt until the last of the water has been run off, covered with moist burlap until set up hard enough to receive the earth curing material which

(Continued on page 15)

Projects 856 *and* 860 Under Construction

By L. C. GREDE, *Resident Engineer*

PROJECTS 856 and 860 comprise that part of the State Highway on Route 19 from the end of the bridge over Toe River at Spruce Pine, N. C., via Ledger to Bakersville the county seat.

These two projects are located along the old Revolutionary trail leading from East Tennessee through the Iron Mountain Gap through what is now known as Bakersville which is at present the terminus of Route 19.

Project 856 extends from Spruce Pine, a distance of 6.9 miles, to Ledger where it is said the first effort at scientifically building a graded road was made in Mitchell County. This consisted of one quarter mile built by Prof. Chas. H. Wing of Boston, who came to Ledger and established a free public library of more than thirty thousand volumes and a school. This road was crowned and rolled, being built some thirty years ago.

This project traverses for the first four miles a country rich in the minerals feldspar and mica as well as potters clay and mining is done on a large scale, the remainder in the vicinity of Ledger is adapted to agricultural pursuits entirely.

The grading on this project, practically completed, averages approximately 15,000 cu. yds. to the mile; total length of tangents 4.43 miles; total length of curves 2.42 miles; total length of curves 2.42 miles; total rise 608′; total fall 496′; maximum single rise 396′; maximum single fall 195′ with 500′ of maximum 6 per cent grade. The total curvature being 2272 degrees, 1335 degrees of this being radii under 300′ and 937 degrees with radii over 300′.

Other than the necessity for careful selection of sub-grade material the construction offers nothing usual in mountainous work.

The proposed pavement is of penetration macadam type, width 16′-24′, excellent quality of stone is obtained from contractor's local quarry centrally located on the project less than 50 yards distance from the highway and easily accessible and economical of operation. Trucks especially designed for the purpose spread the stone as it is dumped.

In the preparation of the sub-grade it was found advisable to construct a clay sub-base as a considerable percentage of cuts and fills contain mica, schist and other objectionable porous materials of poor supporting power. Generally a clay sub-base 6″ in depth in cuts and 12″ on embankments is sufficient although this depth must in a few extreme cases be increased to 1′ 6″. This method of furnishing a stable sub-grade upon which to lay the base course has proven its efficiency beyond a doubt on the one and one-half miles of base course constructed and open to traffic for some period of time, and while suitable sites for clay pits are by no means numerous no great difficulty is anticipated along this line.

Project 860, extending from the terminus of Project 856 at Ledger, to Bakersville, 5.5 miles in length crosses Cane Creek by means of 3 forty-foot spans, which structure in appearance is pleasing to the eye as well as indicative of good workmanship.

The physical characteristics of the country traversed by this project, while to some extent similar to that traversed on Project 856 is more adapted to agricultural pursuits notwithstanding the fact that the topography necessitates more grading per mile, averaging 20,000 cu. yards to the mile.

The characteristics covering grade and alignment are as follows:

Total rise, 406 feet; total fall, 678 feet; maximum single rise, 197 feet; maximum single fall, 283 feet with 2150 feet of maximum 6 per cent grade; total length of curves 2.45 miles; total length of tangents, 3.05 miles; number of curves over 300′ radius, 28; under 300′ radius, 46; minimum radius, 80′; total curvature, 3635 degrees. The grading is practically completed.

A careful discrimination in the use of sub-grade materials is also necessary in this project although not to the extent that it is necessary on Project 856, owing to the absence to a great extent of the objectionable material.

The proposed pavement on this project is of water bound macadam types, width 14′-20′.

Quarry sites are more numerous—on this project and easily accessible as well as permitting economy of operation.

At Bakersville, Project 860, joins the Bakersville-Toecane road, which has an 18′ concrete road 3.67 miles long built by Mitchell County at a cost of more than $200,000. This road connects with the Jack's Creek Road in Yancey County which is being built by the County. The Jack's Creek Road connects with the Bristol-Asheville highway at a point four miles west of Burnsville. This gives the people of this community direct connection over the Bristol-Asheville highway to Asheville.

In the other direction from Spruce Pine, it will give the same people access to Cranberry, Elk Park and into Tennessee, also to Crossnore, Newland, Linville and from there Yonahlossee Road across the Grandfather Mountain to Blowing Rock and from there to Lenoir, Boone and North Wilkesboro. Then by continuing south from Spruce Pine on route No. 19, will have access to the most picturesque scenery in the Blue Ridge Mountains via Gillespie Gap, Little Switzerland and Marion where connection is made with No. 10 State Highway for east

(Continued on page 15)

Project No. 673—Yadkin River Bridge

(*Continued from page 5*)

secured. Silt, clay, and finally sand and gravel were found overlying the rock in about 14′ of excavation for these two piers. Pier No. 4 is on the south river bank and was secured without either sheet piling or a cofferdam, the low stage of the river aiding in this.

Test holes were drilled about 12′ deep into the rock, after all top material was evcavated for foundations, in order to obtain data as to the underlying strata. Piers Nos. 3 and 8 showed small seams at various depths, while results in pier No. 2 showed an open seam of from 9″ to 15″ at a depth of 12′ below original rock surface. This condition was considered unsafe for the load of the piers and additional test holes were drilled into the foundation to determine whether the seam extended throughout the entire footing area. This was found to be the case and an extra work order was secured to cover the expense of washing out the seam and grouting same, estimated cost being $250. A unit price was obtained from the contractor for drilling additional holes to the seam, a total of eight holes, or two rows of four holes, each being put down. Excavation for the footing had advanced to such a stage that it was decided to pour the footing, washing out and grouting the seams afterwards. An eight-foot length of 2″ pipe was placed in each of the eight holes and the footing then poured to an average depth of four feet. This leaving about four feet of each 2″ pipe extending above top of same. Work was then begun of washing out the seam; then the eight holes or pipe. A 2″ line was brought direct from the pump to one of the eight pipes and a pressure as high as 65 pounds maintained while the work progressed. Water would rise and flow from any one of the remaining seven holes bringing mud with it and also small pieces of decayed granite. This was continued until water flowing through any hole was clear and resulted after about four hours steady pumping. At any time, with water entering a corner hole, it would run with considerable force from any one of the other seven holes which were left open, occasionally forcing ahead of it a solid stream of mud or decayed material.

At the time when grouting was commenced it was not known whether pressure would have to be applied to fill the entire seam or not, but arrangements were made to this effect. A 3″ pipe about 10′ long was placed on top of the 2″ pipe above one of the eight holes, a funnel being placed on top of this to receive the grout. This gave a head of grout of 26 feet on top of the seam and proved sufficient to fill all the holes. About two cubic yards of grout were used and within two hours from the time when grouting was commenced it appeared in each of the seven open holes which was an indication that the entire seven had been filled, giving the top layer of rock solid bearing on that underneath. Actual cost of the operation was $237.65.

Excavation work was started for foundations on April 5th and work has progressed rapidly from that date, all foundations being placed and piers brought above high water elevation to the arch backs except on pier No. 1. Estimated quantities show 2,000 cubic yards of Class "B" concrete in foundation work and to date this item is about 90 per cent complete.

Five sets of Blaw-Knox steel circles are being set for centering for the seven arch spans. Tie rods are provided to take the horizontal thrust of each center and thus help stabilize each pier during construction. The usual method of pouring ribbed arches will be followed here; crown sections, both ribs, poured first; then sections adjacent to springing line both sides of arch both ribs; and finally the four intermediate sections.

The Contractor has covered the job with ample equipment, his plant consists of a one cubic yard mixer, materials being transferred from cars to storage piles or to bins over mixer by a clam shell bucket handled by one of the three 110-foot steel derricks on the job. Concrete is handled from the mixer to the first two spans by one of the three steel derricks and thence across the river to each of the remaining spans by a 900-foot cableway in two cubic yard buckets. Lumber for formwork is delivered in the rough, and is then planed and dressed on the job. Forms are built of 1⅞″ lumber on 4″ x 6″ studding at 30″ centers, wales being built 4″ x 6″ centers—ties by ¾″ x ⅝″ bolts.

Very satisfactory work has been secured to date and it is hoped that the structure will surpass in appearance any other built, say, within the State.

Canton-Waynesville Road Being Hard-surfaced

(*Continued from page 3*)

Construction of this project has only been under way for three months. Rough grading and drainage is about 40 per cent complete; structures 20 per cent complete. No pavement has been laid yet.

The biggest problem encountered to date has been detours. Due to the heavy traffic all detours must have some sort of surface. It is impossible to detour all through traffic around the job, due to Project 940 being under construction over which all traffic would have to pass. There are two detours being maintained around sections of the job. One from Lake Junaluska to Waynesville. This detour follows around Lake Juna-

to the Dellwood Road, a concrete road built by the county, thence south about one and one-half miles to Waynesville. Three miles of this detour had to be surfaced with cinders before traffic could travel it. The other detour turns north one mile west of the town of Clyde. It runs north a distance of two and one-half miles to Route 209, thence southwest over Route 209 to Lake Junaluska. The two and one-half miles between Route 10 and 209 had to be surfaced with gravel before traffic could be turned over it. Both of these detours are being maintained by the State maintenance forces. These two detours give the contractor about half of the job to work on without interference

FINISHED SECTION OF SAND ASPHALT ROAD

Conquering *a* Sea *of* Sand

(Continued from page 8)

The pavement is merely what the name implies, being a mixture of sand and asphalt, mixed so as to secure the maximum density. The proportion for base containing from 6 to 9 per cent bitumen and the balance sand. The wearing surface consisting of from 8 to 12 per cent bitumen, 12 to 13 per cent limestone filler and the balance sand. This is laid between permanent 2 x 8 wooden headers 10 feet apart. The finished base is 3 inches thick and the wearing surface is 1½ inches thick, a total for the finished pavement of 4½ inches.

The same standards for engineering and inspection are exacted on this work as on all other State work. A cost record is being rigidly kept which is hoped will prove of inestimable value in future work of this class.

The invention and general accepted use of the automobile has forced upon us a "good roads movement" unparalled in all the history of all the world, and the public is just beginning to realize that the highways are public properties, the building of which is only the beginning, for the problems of maintenance, financing, traffic rules an regulations, policing, control of speed and character of traffic are just as essential to the good service of the highways, as the problems of construction are to the engineers who have been called upon to build them. Education of the public on these problems must necessarily come from highway officials and road builders of the State and Nation.

A little more than twenty-five years ago there were four automobiles in the United States, one of these in a circus. Today automobile registrations have passed the eleven million, five hundred thousand mark and it is estimated that one million, eight hundred thousand new vehicles will be purchased in the United States during 1923.

There are more than two million miles of roads in the United States that are just dirt roads—not even a gravel or sand-clay surface. Some of these are on trans-continental routes, many are on interstate routes, but most are little-traveled country roads. Although the mileage of improved roads is but a fraction of that of dirt ones, the ton-mile and even a vehicle-mile traffic is undoubtedly much greater and the improved roads do and should have more public funds spent on them than the dirt roads.

But this does not mean that the dirt roads should be neglected and the taxpayers who must use them receive no consideration. If the improved roads average 500 vehicles per day over each mile and average $3,000 a year for maintenance and depreciation, while dirt roads average 5 vehicles a day, equal consideration would call for $30 per mile per year for maintenance—not much, but $30 more than the greater part of them receive.

Laurinburg-Maxton Road Being Paved

(Continued from page 11)

is kept sprinkled 14 days and allowed to remain as a covering 21 days as called for in the State of North Carolina specifications.

SHOULDERS

Although the 1922 specifications do not require the shoulders built as the work progresses, on this project shoulders have been built soon after the earth curing was removed and the completed road kept as close to the paver as possible.

This arrangement is not only more satisfactory to the Engineering Department but, at the same time, is of some benefit to the contractor in so much as it allows him to complete the work and get rid of the overhead expense soon after the last of the concrete has been poured. It also gives the engineering crew a chance to keep the final estimate up to date, and, therefore, a quicker settlement to the contractor.

CONCLUSION

Without going into theory I would like to state a few of the facts observed on this work:

First: Whenever the quartzite gravel has been used as aggregate in the concrete, and poured during hot weather, the pavement has shown more cracks than where the granite was used under the same conditions. The theory might be that the quartzite is more brittle than granite, and without the strength under expansion and contraction.

Second: The web reinforced pavement 6:6:6 section has a greater number of lateral cracks than the plain concrete pavement 6:8:6 section poured under the same weather and sub-grade conditions. The theory might be in this case that we are placing the web too close to the surface (2″) and it is taking a different rate of expansion than the surrounding mass of concrete.

Third: The pavement which has shown the least amount of cracks is the plain type F, 6:8:6, poured with the weather conditions between 60 degrees and 70 degrees Far., and therefore I believe type "F" to be the ideal concrete for this section of the State.

Project 980—Macon-Swain Counties

(Continued from page 10)

The highway will enable the mountain folk to get in touch with the affairs of the world, which will tend to broaden their vision of life. Better schools will result with the completion of this highway, for a good highway is essential to the proper establishment and maintenance of good schools. In many sections of this State it has been impossible to secure a good teacher for the reason that travel has been so inconvenient. Proper and sufficiently equipped schools are possible only where highways are in good condition, especially in rural and mountain districts.

Religious institutions are sadly lacking in the communities from Topton to Almond. Even where there are churches, services are held irregularly. But no matter how important the church is toward the development of the future American citizen, if one cannot reach it, if there is no way to it, then its effect is nothing.

This highway is essential and vitally connected with every thing that goes to make life worth while,—materially, mentally, and religiously, for the people along its way.

The accompanying photographs will show some of the beautiful scenery along this highway and the difficulty of its construction. The section has been fittingly called, "The Eden of the Hills," and it has been said that the scenery exceeds by far that of the Rockies.

Projects 856 *and* 860 Under Construction

(Continued from page 12)

or west connection or continuing south on Route 19 to Rutherfordton and connect with No. 20 known as the Wilmington-Charlotte-Asheville Highway.

The benefit to the community or the public in general cannot be accurately estimated but one important direct result has been the consolidating of schools in this vicinity in anticipating of the completion of these two projects, the construction of which is giving employment to numbers of local residents and considerable development of this section, which has heretofore been handicapped by some of the most impassable roads in the state, is expected.

The completion of these two projects will afford tourists and outside people in general access to one of the most healthful sections in the state especially noted for its fruit and good water.

After one reaches what is called the Woody-Gap, three miles from Ledger, the Roan Mountain, which many travelers have pronounced the most beautiful in the world, is in plain view the remainder of the way to Bakersville. This mountain being especially noted for its balsam aroma and is known to afford immediate relief to sufferers from Hay Fever.

Saturation Point *is* Not *in* Sight

THERE are no indications that the United States or any of the individual states are approaching the point of saturation in number of motor vehicles in use. Evidence of this was brought out in the preliminary study by the Good Roads Board of the American Automobile Association of the report of the U. S. Bureau of Public Roads showing the number of motor vehicles licensed in the various states during the first six months of 1923 in comparison with the reports of previous years.

The increase in number of motor vehicles in the United States has continued at approximately the same rate of preceding years, states the Good Roads Board. In the States leading in numbers of motor vehicles where the road programs are also in advance of the other States, and where the first indications of approach to the point of saturation might be expected, the percentage of increase has kept pace and in some instances has outdistanced the records of the Southern States where the road programs are in course of development.

An interesting deduction gathered from the report of the U. S. Bureau of Public Roads is the marked increase in numbers of motor trucks for the six months period as compared with the entire year of 1922, indicating the rapid growth of the use of the motor vehicle for commercial purposes.

In all but nine states, material increases were shown in number of motor vehicles registered during the six months period of 1923 over the entire year's registrations of 1922. With six months yet to go, the record of 1923 in all states will exceed that of 1922.

The State of Ohio climbed up to second place in total number of motor vehicles registered, changing places with California. New York again leads with a total registration during the six months period of 1,025,718 motor vehicles. Ohio is second with 965,000 and California third with 933,808. Pennsylvania is fourth with 922,062; Illinois fifth with 833,920; Michigan sixth with 624,590 and Texas seventh with 571,981. The total number of motor vehicles registered in all of the States during the six months period was 13,002,427 as against 12,238,375 for the entire year of 1922. The total revenue from registration was $167,240,937.76 for the first six months as compared to $152,047,823.74. In addition to the revenue from registrations the states collected from the motorists $8,669,174.03 in taxes on gasoline during the six months period of this year, as compared to a total collection of $11,923,442.61 for 1922. As the gasoline tax is collected as the fuel is used, the record for the year 1923 may be expected to double that of 1922. The gasoline tax in some of the states did not go into effect until late in the year.

The final record for 1923 will indicate that motorists will have paid direct taxes in registration fees to the states and gasoline taxes approximately $200,000,000, according to the Good Roads Board of the A. A. A. This will not include the personal property tax or special registration or gasoline taxes imposed by cities, counties and townships.

American Road Builders' Association

PLANS for the 1924 Convention and road show of the American Road Builders' Association have practically all been completed. These two events are to be held simultaneously the week beginning January 14th. The convention headquarters are to be in the Congress Hotel. The road show will be held in the Coliseum and the adjoining Greer Building.

Mr. Frank Page, president of the American Road Builders' Association, has appointed Mr. Chas. M. Upham manager of the convention and road show. Mr. Upham will report directly to the executive committee of the American Road Builders' Association. With the approval of that committee, Mr. Upham will appoint several committees to handle various features of the two big events of the year in the highway industry.

Mr. Page and Mr. Upham spent some time recently in Chicago making detailed arrangements for both the convention and the show. As a result, all the important preliminaries are already completed. Work also is being pushed on the whole program in such manner as to give ample time for all concerned to make their plans.

Mr. Upham will open an office in Chicago well in advance of the date of the convention and road show. Meanwhile, arrangements are being made so the date of drawings for space in the road show may be announced shortly. General features of the convention also have already been mapped out to an extent that will permit the details to be determined before the end of September.

Mr. S. F. Beatty, president of the Highway Industries Exhibitors' Association, has advised Mr. Page and Mr. Upham that that organization will coöperate in every possible way to make the 1924 road show and convention successful. With the two organizations working together in close harmony, maximum results for both these events are assured.

All inquiries regarding the convention and road show should be addressed to the home office of the American Road Builders' Association at 37 West 39th Street, New York City, until the announcement of the location of the temporary Chicago office has been made.

STATUS OF STATE WORK IN NORTH CAROLINA

Projects Under Construction

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
101	Beaufort	4.23	P. C.	$ 145,492.76	1-20-23	Public Service Production Co.
105B	Beaufort	5.037	P. C.	164,301.61	1-19-23	Public Service Production Co.
106	Bertie	7.12	T. S.	58,204.90	9-11-22	J. F. Mulligan Constr. Co.—Boney & Hostetler.
107	Bertie	19.30	Graded	50,127.00	3-14-23	Nello Teer—Atlantic Bridge Co.
113B	Chowan	9.89	S. A.	100,000.00	4—9-23	State Forces.
115	Chowan-Perquimans	11.83	P. C.	326,304.00	5-15-23	Smith Brothers, Inc.
129	Edgecombe	8.10	Graded	40,850.00	9-14-22	State Forces.
131	Gates	15.95	T. S.	135,515.60	8-22-22	Bacon & Moore—W. D. Murray—Saddler Corp.
132	Gates	10.90	T. S.	63,921.00	8-29-22	J. A. Marrow.
133	Gates-Pasquotank	14.07	Gravel	138,045.77	1-17-22	C. W. Lacy—Pittsburg Des Moines Steel Co.
137	Halifax	5.95	Bit. Mac. and P. C.	180,441.92	11-21-21	O. F. Leighton—A. C. House.
138A	Halifax-Northampton	12.59	S. C.	131,712.13	5—1-22	Nello Teer—Richards Brothers.
138B	Northampton-Halifax	--------	Bridge	347,188.74	2-28-23	Pensacola Shipbuilding Co.
141	Halifax Edgecombe	8.76	T. S.	220,679.58	8—8-23	J. P. Dicus—J. A. Peterson.
145	Hertford	112.88	Graded	88,161.42	7-31-22	Jamison & Bro., Atlantic Bridge Co.
146	Hertford-Bertie	6.42	T. S.	60,772.14	8—8-23	Nello Teer—Atlantic Bridge Co.
147	Hertford-Bertie	17.36	Graded	122,245.86	3—5-23	Nello Teer—Atlantic Bridge Co.
151	Hyde	4.30	T. S.	71,422.28	12-10-21	C. W. Lacy—Porter & Peck.
152	Hyde	10.89	S. C.	75,651.40	1-15-23	O. A. Mann & Co.
154	Martin	11.27	A. C.	394,153.29	4-17-22	Sou. Willite Paving Co.—O. F. Leighton, Inc.
154B	Martin	1.34	A. C.	37,690.00	8-27-23	State Forces.
155B	Martin	19.30	P. C.	493,900.40	------------	W. T. Hadlow.
163 FA 149	Nash	14.96	P. C.	409,592.40	6-15-23	Public Service Production Co.
167	Northampton	20.48	T. S.	92,444.11	7-17-22	Virginia Contracting Co.—Bacon & Moore.
168	Northampton	16.30	T. S.	107,229.87	8-27-23	Nello Teer.
173	Perquimans-Pasquotank	7.22	R. C.	239,444.70	8-25-22	Williams & Williams.
174	Pasquotank-Camden	2.40	Cord	55,818.01	4—3-22	D. E. Williams.
183A	Pitt	13.54	P. C.	399,854.40	11-13-22	S. J. Groves & Sons.
183B	Pitt	--------	Bridge	32,343.30	3-27-22	B. J. Boyles.
184	Pitt	7.14	P. C.	206,516.42	11-31-22	Public Service Production Co.
185	Pitt	14.35	Graded	31,069.72	3-29-23	J. A. Marrow.
189	Pitt	5.30	P. C.	210,247.07	8—7-23	Smith Bros., Inc.—Pittsburg Des Moines SteelCo.
191	Tyrell	6.91	S. C.	58,594.41	1-20-22	C. W. Lacy—M. M. Jones.
196	Washington	14.93	S. C.	83,632.78	5-15-22	W. N. Thompson.
200	Carteret	13.68	Graded	79,629.00	7-21-22	Eagle Engineering Co.—Batson-Cooke Co.
201	Carteret	14.14	Graded	81,652.62	1-17-23	Duplin Construction Co.—Batson-Cooke Co.
207	Craven	3.00	Gravel	10,000.00	7-27-23	State Forces.
208	Craven	4.50	Gravel	15,000.00	7-27-23	State Forces.
210	Craven	8.34	A. C.	292,698.06	4—3-22	West Construction Co.—A. P. Gilbert.
213 FA	Craven	10.43	A. C.	447,053.53	8—1-23	F. G. McGuire—Eagle Engineering Co.
219	Duplin-Lenoir	15.80	Graded	148,339.29	6—1-22	Chitwood & Carpenter.
220	Wayne-Duplin	14.53	A. C.	394,301.05	2-27-23	Union Paving Co.
236 FA 143	Johnson	14.83	A. C.	475,321.55	10—2-22	R. G. Lassiter & Co.
245	Jones	15.80	P. C.	265,179.53	3-22-22	Hyde & Baxter.
254	Lenoir	--------	Bridge	73,415.32	11-22-22	Roanoke Iron and Bridge Co.
256	Lenoir	--------	Bridges	57,680.00	1-11-23	Englehardt-Kuchen.
263	Pamlico	12.03	A. C.	289,324.20	3-27-22	Union Paving Co.
264	Craven-Pamlico	--------	Bridge	27,156.25	7-24-22	Rhyne & Kitchen.
272	Sampson	16.47	Graded	98,807.39	6-19-22	R. E. Martin—Striblin-Standdy & Newell.
273	Sampson	2.44	P. C.	96,916.82	2-27-23	Eagle Engineering Co.
275	Sampson	--------	Bridges	8,769.74	4—4-23	Rhyne & Kitchen.
282	Wayne	14.22	A. C.	398,168.00	11-11-22	Union Paving Co.
291	Wilson	7.50	A. C.	203,493.18	1-17-22	P. R. Ashby.
291B	Wilson	--------	Bridges	12,990.23	4—4-23	John M. Ogden & Co. (Road not let).
291C	Wilson	0.31	Grade	15,532.00	------------	C. S. Wheeler.
294	Wilson	--------	Bridge	15,770.80	11-29-22	Stearns Brothers.
312	Brunswick	9.77	P. C.	347,319.68	7—5-22	Alabama Con. Prod. Co.—Batson-Cooke Co.
314	Brunswick	15.82	S. C.	109,259.10	2-23-22	Hagedorn Construction Co.
316	Brunswick	12.12	S. C.	80,068.72	8-14-22	B. Frank Price—Batson-Cooke Co.
326	Columbus	13.61	S. C.	195,838.19	5-23-22	J. T. Plott—J. A. Kreis & Co.
328	Columbus	7.03	P. C.	219,371.68	12-26-22	L. L. Tindall.
340	Cumberland	11.07	P. C.	381,032.02	6-15-22	Alabama Concrete Prod. Co.-Hobbs & Peabody.
342	Cumberland	5.91	A. C.	177,402.50	10-30-22	A. J. Wardrep.
351	New Hanover	10.64	A. C.	189,540.00	1—8-23	Southern Willite Paving Co.
363	Onslow	15.24	T. S.	208,476.95	3—5-23	Newell Constr. Co.—Pittsburg Des Moines Steel Co.
364B	Onslow	12.84	T. S.	99,819.50	6-26-22	A. W. McClay.
366	Onslow	18.5	S. A.	200,000.00	6-15-23	State Forces.
378	Pender	14.12	W. B. Mac	213,502.96	7-19-22	C. W. Lacy.
380	Pender	8.98	W. B. Mac	162,212.60	3—6-23	C. W. Lacy.
382	Pender	5.60	S. A.	60,000.00	4-25-23	State Forces.

STATUS OF STATE WORK IN NORTH CAROLINA---*Continued*

Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
386 387 F A 140	Robeson	19.80	P. C.	647,888.05	9—4—22	Jas. O. Heyworth.
389	Robeson-Columbus	1.56	T. S.	83,463.38	10-26-21	L. A. Chitwood
391B	Robeson	1.10	T. S.	17.433.00	2-26-23	H. M. Beasley.
392	Robeson	1.06	T. S.	85,049.91	5—1-23	Robeson County Com.—E. T. Gwathmey.
402	Chatham	6.92	T. S.	33,940.28	8—1-22	W. N. Thompson.
403	Chatham	7.01	Gravel	66,814.00	2-17-23	C. G. Kershaw.
408	Durham	0.47	S. A.	4,820.00	6—7-23	Murray Construction Co.
412	Durham	8.80	P. C.	252,582.00	11-15-22	L. L. Tindall.
419	Franklin	12.82	T. S.	63,021.97	7-27-22	Jamison & Bro.—J. M. Gregory.
428	Granville	4.19	R. C.	142,637.77	7-14-22	Pittman Construction Co.
429	Granville	6.94	P. C.	261,397.29	3-21-23	R. B. Sandidge.
437	Harnett	10.74	Gravel	101,031.26	5—8-23	F. P. Holden—T. J. Newell.
438	Harnett	3.82	P. C.	158,316.57	7-16-23	J. M. Gregory—T. J. Newell.
446	Lee	5.05	A. C.	209,090.00	5-24-22	Atlantic Bitulithic Co.—O. A. Mann.
456	Orange	9.81	Graded	37,459.07	1—7-22	Crawford & Crawford—Nello Teer.
457A	Orange	7.45	Graded	75,398.67	4-12-23	Dicus Bros.—Richards Bros.
460	Orange	9.87	A. C.	296,835.55	9-25-22	R. M. Hudson & Co.
463	Person	11.24	P. C.	327,171.35	8-14-22	Porter & Boyd.
464	Person	11.58	T. S.	85,179.27	8-13-23	Micheaux Construction Co.
473 F A 146	Vance	7.83	P. C.	265,546.60	7-11-22	R. G. Lassiter & Co.
481	Wake	7.40	A. C.	254,995.34	1-24-22	Union Paving Co.—P. R. Ashby Co.
484	Wake	8.79	P. C.	311,590.40	8-23-22	P. R. Ashby—Booz-Lloyd & Co.
484B	Wake		Bridge	13,112.99	7—2-23	Booz-Boyd.
485A	Wake	7.35	Graded	92,818.00	5—4-23	C. G. Kershaw Constr. Co.—T. J. Newell.
485	Wake	9.04	T. S.	41.074.00	4-11-23	O. A. Mann & Co.
492	Warren	4.48	Bit. Mac.	100,436.13	4-10-22	Porter & Peck—A. C. House.
493	Warren	3.39	Bit. Mac.	77,866.80	7-27-22	Porter & Peck.
494 F A 147	Warren	6.21	A. C.	208,130.01	9—6-22	Clifford Engineering Co.
502	Alamance	17.43	T.S.&B.M.	138,629.97	7-17-22	W. E. Graham—Hanford Brothers.
511	Caswell	14.80	T. S.	73,242.18	12-12-21	White & Simpson—C. B. Hester.
512	Caswell	11.67	T. S.	54,375.53	2-19-23	J. T. Plott.
522	Davidson	1.00	P. C.	37,856.50	6-29-23	Hagedorn Construction Co.
525	Davidson	10.24	A. C.	363,850.08	12-23-21	Elliot & Sons & Boggs—Austin Bros. Bridge Co.
528	Davidson	10.24	P. C.	427,511.92	10—2-22	Hagedorn Constr. Co.—J. A. Peterson.
532	Guilford	11.70	A. C.	385,957.88	2—1-22	Eliot & Sholes & Co.
532B	Guilford		Bridges	24,730.00	1—5-23	L. M. Lowdermilk.
535	Guilford	7.78	R. C.	290,605.21	4-19-22	Leaksville Lumber Co.
541	Guilford	4.31	Bit. Mac.	119,469.24	8-15-23	Hagedorn Construction Co.
545	Hoke	9.15	T. S.	58,195.06	6—5-22	O. A. Mann & Co.—A. W. McClay.
555	Montgomery	20.55	T. S.	103,703.38	2-19-23	Mayfield Construction Co.—F. P. Holder.
556	Montgomery	3.07	Bit. Mac.	78,704.00	9—4-23	J. F. Mulligan Construction Co.
569	Moore	18.97	S. C.	97,151.45	8—1-22	Mayfield Construction Co.
570	Moore	22.52	T. S.	89,804.33	5-22-23	A. B. McDonald.
577	Randolph	13.77	P. C.	422,343.57	4-18-22	Royer, Ferguson & Co., Inc.—J. L. Brinkley.
578 F A 156	Randolph	7.97	P. C.	312,662.68	5-10-23	Allport Construction Corporation.
588	Rockingham	7.98	R. C.	266,498.43	4-11-22	Cheatwood & Driscoll.
589	Rockingham	9.81	P. C.	324,975.31	10-30-22	Cheatwood & Driscoll—Atlantic Bridge Co.
590	Rockingham	2.10	P. C.	66,092.18	6-15-23	Geo. R. Martin.
602	Alexander	9.28	Bit. Mac.	189,329.80	10—9-22	W. E. Graham.
608	Anson	7.85	A. C.	345,408.58	9-27-22	Lampton & Burks—J. A. Peterson.
608B	Anson	3.83	Grading	44,224.10	7-20-23	Ben F. Teeter—J. A. Peterson.
614 F A 144	Cabarrus	9.20	P. C.	353,590.00	7-21-22	A. L. Harris—Oliver & Costello Brothers.
615	Cabarrus	3.88	A. C.	98,741.17	3—9-23	Thompson-Caldwell—Atlantic Bridge Co.
616	Cabarrus	8.59	T. S.	46,024.00	4-11-23	Lee J. Smith—L. M. Lefler & Smith.
622	Catawba	10.85	A. C.	353,590.00	1-23-22	Union Paving Co.
629	Catawba	7.52	P. C.	268.662.48	6—5-22	A. L. Harris—R. M. Thurmond & Co.
630B	Gaston	6.65	A. C.	218,625.00	8—8-22	W. F. McCanless, Hobbs-Peabody Constr. Co.
632	Gaston	8.50	R. C.	291,868.94	1—2-22	Davis-Wilcox Construction Co.
633B	Gaston	3.37	A. C.	57,247.41	1-16-23	Gaston County.
639	Iredell	10.59	A. C.	387,346.19	1—2-22	R. M. Hudson Co.—Luten Bridge Co.
640	Iredell	8.17	Bit. Mac.	181,990.82	9-26-22	W. E. Graham.
643 F A 157	Iredell	8.57	A. C.	321,614.81	5-21-23	Stearns Brothers.
647	Lincoln	7.10	P. C.	250,108.15	6—5-22	A. L. Harris—R. M. Thurmond & Co.
653	Mecklenburg	8.84	A. C.	308,732.43	2-28-22	Union Paving Co.—Luten Bridge Co.
654	Mecklenburg	10.10	A. C.	302,887.09	4—3-22	Lampton & Burks.
658 F A 145	Mecklenburg	9.55	A. C.	266,758.80	10—9-22	Union Paving Co.
659	Mecklenburg	7.93	Graded	36,650.00	4—9-23	County Commissioners—Luten Bridge Co.
661	Richmond	9.76	T. S.	40,683.41	7-18-22	McDonald & Brooks.
665	Richmond	5.77	A. C.	194,501.23	7-28-22	A. J. Wardrep.
670	Cabarrus-Rowan	4.53	P. C.	142,221.53	6-29-22	Harris Construction Co.
671	Rowan	7.43	A. C.	309,262.14	3-20-23	Thompson-Caldwell Constr. Co.—Atlanti Bridge Co.
673	Davidson-Rowan	.59	Bridge	221,353.00	9-19-22	Hardaway Contr. Co.—Elliot & Sons.
677	Scotland-Robeson	7.11	R. & P. C.	283,460.61	4-26-22	P. R. Ashby—J. B. Murphy.
679	Scotland		Bridges	29,570.00	7—1-23	P. R. Ashby.
691	Union		Bridge	14,520.00	2-13-23	J. S. Brinkley.

STATUS OF STATE WORK IN NORTH CAROLINA—*Continued*

Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
694	Union	--------	Bridge	23 ,549.13	11—4-22	Hagedorn Construction Co.
696	Union	6.05	A. C.	139 ,901.30	3-10-23	Redmon Construction Co.
700	Alleghany	7.90	W. B. Mac	132 ,297.33	6-23-21	W. E. Graham.
701	Alleghany-Wilkes	8.00	W. B. Mac	166 ,245.20	6-16-21	W. E. Graham.
702A	Alleghany	7.75	B. M. & Gravel	209 ,188.98	10-31-22	O'Brien Constr. Co.—Luten Bridge Co.
702B	Alleghany	6.49	Gravel	191 ,737.26	8—6-23	Turner-Hartsoe—Luten Bridge Co.
711	Ashe	6.50	Gravel	60 ,000.00	9—7-22	Little Contracting Co.
712	Ashe	11.06	Gravel	197 ,687.38	10-24-22	J. T. Plott.
713 {F A 139	Ashe	3.53	P. C.	166 ,595.00	8-22-22	Overstreet & Nance—Concrete Steel Bridge Co.
726 726A	Caldwell	11.00	Gravel	50 ,000.00	5—5-23	State Forces J. F. Mulligan Construction Co.
741	Forsyth	8.90	P. & R. C.	315 ,025.81	7-27-22	Hardaway Construction Co.
742 {F A 137	Forsyth	10.62	R. C.	413 ,067.27	7-20-22	Harris Construction Co.
743	Forsyth	11.35	A. C.	414 ,085.43	4—2-23	Atlantic Bitulithic Co.
750	Stokes	14.86	T. S.	93 ,054.48	9-15-21	J. F. Mulligan Constr. Co.—Lee J. Smith.
752	Stokes	9.67	T. S.	124 ,874.75	2-17-23	W. E. Graham.
761	Surry	2.22	P. C.	77 ,334.01	11-22-22	Geo. R. Martin.
765	Surry	3.40	P. C.	112 ,685.76	10—2-22	Campbell Construction Co.
770A	Wautauga	3.00	Bit. Mac.	40 ,000.00	8-12-22	State Forces.
770B	Wautauga	8.90	Gravel	93 ,500.00	4-16-23	State Forces.
771A	Wautauga	2.50	Bit. Mac.	30 ,000.00	9—7-22	State Forces.
771B	Wautauga	13.50	Gravel	35 ,000.00	9—7-22	State Forces.
780	Wilkes	7.83	Recon.	25 ,000.00	11-25-21	J. F. Mulligan—State Forces.
781	Wilkes	14.50	Recon.	154 ,000.00	8—8-21	J. F. Mulligan—State Forces.
784	Wilkes	4.97	T. S.	85 ,966.21	9-27-22	J. F. Mulligan Constr. Co.—Foster Constr. Co.
785	Wilkes	2.52	P. C.	78 ,703.50	4—2-23	J. D. Brookshire & Co.
790	Yadkin	10.12	P. C.	330 ,254.27	4-24-22	Pittman Construction Co.
800	Avery	5.84	Gravel & R. C.	198 ,827.02	7-31-22	O'Brein Constr Co.—J. A. Kreis.
802	Avery	5.68	Graded	98 ,043.44	7-30-23	Hughes & Rae.
811	Burke	5.24	P. C.	185 ,132.97	1-13-22	Southern Dray Co.
812A	Burke	4.89	Grading	58 ,629.01	7—6-23	M. A. Kolloch—Padgett & Justice.
815	Burke-Cleveland-Lincoln	11.63	T. S.	153 ,126.60	3-20-23	Geer & Wilson—J. L. Von Gladen.
821	Cleveland	1.58	P. C.	60 ,192.33	10-31-22	Davis-Wilcox Construction Co.
822 {F A 150	Cleveland	10.47	A. C.	404 ,444.48	9-27-22	Elliot & Sons—J. A. Kreis & Co.
833	Henderson	5.20	Gravel	34 ,952.94	1—3-22	S. L. Davis Constr. Co.—Asheville Constr. Co.
835	Henderson	6.82	W. B. Mac	286 ,019.91	9—9-23	J. B. Ross, Jr.—R. C. Stevens.
836	Henderson	9.10	Grading	145 ,686.75	7-13-23	J. B. Hawkins—J. L. Von Glahn & Co.
846	McDowell	10.06	Gravel	204 ,680.74	9-22-21	Asheville Constr. Co.—W. T. Taylor Constr. Co
847	McDowell	3.84	Graded	91 ,217.50	10-19-22	C. W. Lacy—Oliver & Costello Brothers.
848	McDowell	--------	Bridge	18 ,597.04	11-21-22	R. M. Thurmond & Co.
856	Mitchell	6.88	Bit. Mac.	239 ,343.83	3-20-22	Porter & Boyd—L. J. Chandler & Co.
858	Mitchell	--------	Bridge	42 ,367.49	10—2-22	R. M. Thurmond & Co.
860	Mitchell	5.58	W. B. Mac	152 ,922.00	4-30-22	J. F. Mulligan Constr. Co.—W. H. Anderson Constr. Co.
866	Polk	5.96	Bit. Mac.	180 ,393.40	11-21-11	Southern Paving Co.—Henry Constr. Co.
876 {F A 78B	Rutherford	4.80	P. C.	146 ,264.80	10-30-22	Fisk-Carter Construction Co.
882	Rutherford	15.80	T. S.	94 ,666.00	9-20-22	C. R. Willard & Sons.
882B	Rutherford	--------	Bridge	10 ,582.00	5—3-23	Micheaux Construction Co.
888	Yancey	15.22	W. B. Mac	230 ,499.94	10-10-22	The Luck Co.
901 {F A 148	Buncombe	7.52	P. C.	354 ,082.45	11—6-22	R. C. Stevens—A. J. Wardrep.
903	Buncombe	2.58	A. C.	100 ,399.47	4-10-22	Asheville Paving Co.—R. C. Stevens.
911	Cherokee	10.33	Gravel	144 ,991.44	10-25-21	H. A. Wells—Southern Dray Co.
913	Cherokee	10.33	W. B. Mac	95 ,554.80	8—8-22	Mills-Williams Construction Co.
920	Clay	5.01	Gravel	50 ,716.66	1—9-22	E. A. Wilson & Co.—W. T. Moore Conc Prod Co.
921	Clay	12.37	Gravel	90 ,988.02	10-24-21	Lee J. Smith Constr. Co.—W. T. Moore Conc. Production Co.
930	Graham	12.90	Gravel	143 ,574.20	10-15-21	Lee J. Smith Constr. Co.—C. M. Dicus.
940	Haywood	7.13	W. B. Mac	126 ,069.30	4-14-22	Alexander & Patton—H. A. Brown & Co.
944 {F A 16	Haywood	10.18	A. C.	410 ,068.45	5-14-23	A. J. Wardrep.
950	Jackson	7.56	Gravel	145 ,313.30	6-13-21	Wright & Nave—O'Brien Constr. Co.
951	Jackson	11.58	W. B. Mac	249 ,546.00	8-17-22	R. H. Wright & Sons—W. T. Moore Conc. Prod. Co.
952A	Jackson	10.35	Graded	164 ,126.60	8-17-22	Brooks-Calloway Co.
953	Jackson	12.72	Graded	118 ,186.75	7—1-22	C. C. McCabe.
954	Jackson	1.68	P. C.	90 ,871.77	7—1-22	Mills-Williams Construction Co.
960	Macon	4.97	S. C.	69 ,100.57	6—6-21	J. T. Plott—J. E. Lane & Co.
961	Macon	4.77	T. S.	58 ,340.59	12-5-21	J. T. Plott—J. E. Lane & Co.
962	Macon	13.58	W. B. Mac	171 ,200.05	4-24-22	O'Brien Constr. Co.—Griffin Constr. Co.
963	Macon	8.68	Graded	124 ,354.01	11-10-22	Costello Bros.—Brooks-Calloway Co.
970	Madison-Yancey	13.80	W. B. Mac	218 ,940.17	11-11-21	R. H. Wright & Sons—O'Brien Constr. Co.
971	Madison	6.74	Gravel	183 ,090.38	4-23-23	Reynolds Constr Co.—Moore Conc. Prod. Co.
972	Madison	6.60	Grading	50 ,000.00	4—6-23	State Forces—C. M. Dicus.
980	Macon-Swain	17.84	W. B. Mac	350 ,175.11	3-20-22	Costello Bros.—Condon & Condon.
990	Transylvania	8.87	W. B. Mac	151 ,238.89	6—5-22	Sam L. Davis Constr. Co.—R. C. Stevens.
991	Transylvania	7.03	Graded	156 ,653.20	3—6-23	Gibson Construction Co.

STATUS OF STATE WORK IN NORTH CAROLINA—*Continued*

Projects Completed

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
100	Beaufort	10.50	R. C.	$ 369,777.70	3-15-23	W. T. Hadlow
103	Beaufort	.03	R. C.	1,706.75	7—3-22	R. G. Lassiter.
105A	Beaufort	2.00	P. C.	78,839.42	7-16-23	J. L. McGhee Contracting Co.
110	Camden	2.71	R. C.	134,866.48	7-20-23	State Forces.
113	Chowan	10.32	Graded	39,743.33	3—1-23	Nello Teer—Gregory & Talbot.
114	Chowan	10.40	Graded	45,064.09	4-14-23	Battershill & Goode—Chandler & Ragland.
125	Edgecombe	15.11	A. C.	426,438.76	4-23-23	R. G. Lassiter.
139	Halifax	....	Bridge	*20,425.59	8-25-22	Chandler & Ragland—Porter & Peck.
140	Halifax	....	Bridge	*11,043.05	5—5-22	Von Glahn & Talbott.
159	Nash	11.22	T. S.	89.942.43	7-30-23	J. A. Kreis & Co.
160	Frklin.-Wake-Nash	8.93	T. S.	53,722.95.	3—7-23	Chandler & Ragland—Southern Dray Co.
166	Northampton	.47	Bridge	17,954.75	9-14-22	W. D. Murrey—Sadler Corp.
175	Pasquotank	9.50	Brick	217,405.72	4-19-23	County Commissioners.
186	Pitt	9.57	R. C.	*248,103.78	8—5-22	Cheatwood & Driscoll.
209	Craven	2.65	P. & R. C.	*114,569.02	1-28-22	Eagle Engineering Co.
211	Craven	9.93	A. C.	288,946.02	5-16-23	Union Paving Co.
218	Wayne-Duplin	16.06	Graded	92,589.58	2-24-23	C. W. Lacy
227	Greene	6.81	A. C.	239,797.80	1-25-23	West Construction Co.—Union Paving Co.
255	Lenoir	0.82	S. A.	30,384.89	8-18-22	West Construction Co.
280	Wayne	10.01	A. C.	311,352.36	5-12-23	Union Paving Co.
281	Wayne	....	Bridge	*21,225.49	1-15-23	P. R. Ashby.
300	Bladen	11.99	S. C.	64,911.71	6-16-23	T. W. Chandler—Nello Teer.
301	Bladen	13.17	T. S.	82,028.21	2-20-23	J. F. Mulligan—Powell Paving and Constr. Co.
325	Columbus	11.22	T. S.	105,530.04	7-14-23	J. A. Kreis—Cornell & Young & Co.
338	Cumb.-Sampson	....	Bridge	26,323.99	9-26-22	Roanoke Bridge & Iron Works.
339	Harnett-Cumb	.754	T. S.	19.067.28	8-31-22	Porter & Boyd
341	Cumb -Hoke	.2	Graded	*1,042.55	2-28-22	W. B. Covington
375	Pender	13.56	S. C.	68,830.09	11-21-22	A. W. McClay
388	Robeson	3.35	R. C.	137,009.40	9-28-22	C. W. Lacy—Roanoke Bridge & Iron Co.
400	Chatham	....	Bridge	57,420.22	5-18-23	R. M. Walker & Co.
400A	Chatham	....	Grading	5,400.00	8-27-23	C. B. Hester.
409	Durham	0.5	Graded	*5,409.10	8—7-22	J. P. Dicus.
410	Durham	2.3	R. C.	*81,105.75	9-28-22	C. D. Riggsbee.
411	Durham	5.81	P. C	211,574.92	7-12-23	Hutton Engineering and Construction Co.
420	Franklin	1.56	R. C.	55,421.30	5-29-23	Chandler & Ragland.
427	Granville	5.12	A. C.	178,257.64	1—4-23	R. G. Lassiter & Co.
436	Harnett	21.91	Gravel	202,563.88	1-15-23	C. G. Kershaw Const. Co.—Hobbs & Kitchen.
445	Lee	5.91	T. S.	18,692.85	1-15-23	C. B. Hester
453	Orange	....	Bridge	33,706.80	1—9-23	Geo. W. Kane.
454	Orange	4.28	P. C.	197,675.32	3—6-22	Elliott, Sholes & Teer.
455	Orange	4.19	T. S.	*55,214.44	9-28-22	J. F. Mulligan Const. Co.—P. R. Ashby.
481	Wake	7.40	A. C.	254,995.34	....	Union Paving Co.—P. R. Ashby.
482	Wake	6.64	A. C.	*184,393.31	9-23-22	R. M. Hudson Company.
483	Wake	0.54	R. C.	*15,630.74	8—7-22	C. D. Riggsbee.
485C	Wake	0.50	Grade	10,613.90	7-31-23	Booz-Boyd—Nello Teer.
500	Alamance	5.22	Graded	*36,844.34	1-17-22	W. W. Tuck & Son—A. M. Hazell, Connerate—Quist Construction Co.
501	Alamance	13.1	T. S.	30,927.27	2-28-23	W. M. Shook-Hanford Bros.
503	Alamance	....	Bridge	59,450.38	7-20-23	Atlantic Bridge Co.
504	Alamance	5.22	A. C.	154,127.16	5—3-23	Elliot & Sholes.
505	Alamance	0.42	S. A	*15,229.74	6-23-22	Hedrick Construction Co.
506A	Alamance	0.32	Grade	8,866.45	8-11-23	Nello Teer.
524	Davidson	0.3	S. A.	*9,941.54	1-20-22	Town of Lexington.
525A	Davidson	.5	S. A.	*16,419.86	6-27-21	Town of Lexington.
526	Davidson	3.77	P. C.	*131,269.66	10-25-22	Hagedorn Constr. Co.—Heilig & Sherrill.
533	Guilford-Forsyth	10.59	P. C.	427,997.62	7-23-23	Royer-Ferguson Construction Co.
538	Guilford	....	Bridge	7,039.01	2-21-23	J. L. Brinkley.
539	Guilford	0.64	S. A.	21,639.20	1-19-23	Robt. G. Lassiter & Co.
540	Guilford	18.00	Recon.	16,527.54	1-23-22	J. T. Plott.
544	Hoke	10.45	S. C.	32,445.49	5—3-23	O. A. Mann & Co.—Chitwood & Carpenter.
546	Hoke	0.84	S. A.	27,949.00	5-30-23	Dawkins Construction Co.
566	Moore	7.14	T. S.	62,079.21	6-30-23	Gibson Construction Co.—Nello Teer.
567	Moore	2.96	T. S.	*9,967.53	9-18-22	C. E. Teague.
593	Rockingham-Caswell	17.98	P. C.	552,393.22	8-18-23	J. A. Kreis.
600	Alexander	9.30	Graded	12,530.98	4-14-23	Bolton Construction Co.
601	Alexander	3.07	T. S.	33,630.45	3-31-23	Guss Ginn-R. M. Thurmond
606	Stanley-Anson	....	Bridge	55,802.03	6—6-23	Concrete Steel Bridge Co.
607	Anson	6.93	T. S.	41,324.35	5-17-23	Geer & Wilson—Booz-Lloyd & Co.
630A	Gaston	3.02	A. C.	*98,854.41	7- -22	W. F. McCanless.
633A	Gaston	13.77	A C.	57,247.41	10-5-22'	Gaston County
634	Gaston	Bridge	Recon.	4,344.00	....	State Forces.
638	Iredell	7.88	A. C.	262,142.65	1-20-23	Thompson-Caldwell Co.
652	Mecklenburg	....	Bridge	2,383.88	10-30-22	State Forces.
655	Mecklenburg	1.57	P. C.	51,658.44	7-31-22	Speed-Parker Co., Inc.—Luten Bridge Co.
656	Mecklenburg	10.4	Bit.-Mac.	7,198.07	10-30-22	State Forces.
657	Mecklenburg	13.80	Recon.	15,961.02	10-30-22	State Forces.
692	Union	2.28	A. C.	*65,279.20	12-28-21	Redmon Construction Co.

(*Final Cost)

STATUS OF STATE WORK IN NORTH CAROLINA---*Continued*

Projects Completed—Continued

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
693	Union	1.14	T. S.	$ 3,324.48	2-23-23	Sykes-Collins Co.
695	Union	4.51	A. C.	*138,738.07	9-14-22	Redmon Construction Co.
710	Ashe	3.14	P. C.	*142,707.93	8-17-22	Pittman Construction Co.
719	Caldwell		Bridge	*7,906.87	9-19-22	Cottrell & Howard.
719B	Caldwell	.99	Gravel	*1,235.33	11-15-22	J. G. Bumgardner
722	Caldwell	7.40	Recon	*20,923.25	1-18-22	County Forces.
724	Caldwell	4.66	T. S.	51,890.66	7-24-23	County Forces—R. M. Thurmond & Co.
725	Caldwell	4.00	Recon	28,015.46	2-24-23	County Commissioners.
731	Davie	5.46	P. C.	195,393.11	7-21-23	G. R. Martin—Heilig & Sherrill.
744	Forsyth	2.00	T. S.	15,000.00	8-10-23	Forsyth County.
751	Stokes	7.16	T. S.	*35,124.08	8-26-22	W. E. Graham.
760	Surry-Alleghany	6.9	T. S.	*32,084.18	11-5-22	W. E. Graham.
764	Surry	1.63	R. C.	50,588.20	2—4-23	Leaksville Lumber Co.
782	Wilkes	5.97	R. C.	184,614.65	8—4-23	Hyde & Baxter.
783	Wilkes-Watauga	36.00	Gravel	159,000.00		Chandler & Ragland.
801	Avery	.99	W. B. Mac	22,350.24	10-26-22	Geer & Wilson.
814	Burke	8.69	S. C.	13,459.60	4-25-23	M. A .Kollock.
823	Cleveland	1.90	P. C.	*80,421.65	8-15-22	Southern Paving Co.—Z. B. Weathers & Son.
844	McDowell	2.05	P. C.	*61,233.34	12-13-21	Bolton Construction Co.
845	McDowell	7.19	Gravel	132,177.93	12-22-22	J. W. Stapp Constr. Co.–Praytor, Howton&Wood
855	Mitchell	4.72	P. C.	174,393.78	4-17-23	Fisk-Carter Construction Co.
855B	Mitchell		Bridge	*22,699.85	8-22-22	Luten Bridge Co.
875	Rutherford		Bridge	*6,151.61	7-18-22	Geer & Wilson
877	Rutherford	9.79	T. S.	64,563.73	8—7-22	Geer & Wilson.
878	Rutherford	6.55	T. S.	44,984.50	10-27-22	Micheaux Const. Co.—Geer & Wilson.
879	Rutherford		Bridge	*6,781.99	6-21-22	Austin Bros. Bridge Co.
880	Rutherford		Bridge	24,679.43	3-23-23	Austin Bros. Bridge Co.
904	Buncombe	1.60	A. C.	80,969.13	6-23-23	Asheville Paving Co.—R. C. Stevens.
910	Cherokee	7.56	Gravel	76,743.59	2-24-23	Ross Bros. Constr. Co.—W. T. Moore Concrete. Prod. Co.
942	Haywood	0.57	Gravel	*6,490.43	2—1-22	O'Brien Construction Co.

(*Final cost)

PROJECTS UNDER CONTRACT

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	CONTRACTOR
108	Bertie (sheet piling)			$ 13,481.86	E. T. Gwathmey.
180	Perquimans	9.96	P. C.	249,192.90	Smith Brothers, Inc.
185C	Pitt	14.35	P. C.	463,802.35	Groves & Shephard.
230	Greene	5.40	P. C.	220,576.18	Smith Bros., Inc.—Pittsburg Des Moines Steel Co.
293	Wilson	8.99	P. C.	384,222.08	Smith Bros., Inc.—Pittsburg Des Moines Steel Co.
295	Wilson	9.92	Recon.	124,060.64	Highway Engineering and Construction Co.
329{F A 155	Columbus	12.88	A. C.	422,462.60	Jas. O. Hayworth.
421	Franklin	8.23	R. C.	61,002.48	J. A. Marrow.
431	Granville	3.83	T. S.	42,895.71	Micheaux Construction Co.
495	Warren	7.81	T. S.	71,122.15	J. A. Marrow.
506A	Alamance	0.32	Grading	9,866.45	Nello Teer.
507	Alamance	4.03	P. C.	121,966.68	Zeigler & Dalton.
532C	Guilford	0.50	P. C.	12,650.00	W. B. Kiker.
592	Rockingham	8.22	P. C.	310,101.66	Zeigler & Dalton—J. L. Brinkley.
611	Anson	5.94	P. C.	176,546.00	Jas. O. Hayworth.
672	Rowan	3.54	A. C.	167,756.27	Stearns Bros., Inc.—J. A. Kreis.
679	Scotland		Bridges	16,885.00	E. T. Gwathmey.
697A	Union	6.51	P. C.	301,183.80	Jas. O. Hayworth.
811B	Burke		Bridge	16,013.80	R. W. Curtis.
837B	Henderson	5.83	A. C.	83,113.14	Dixon Construction Co.
902	Buncombe	4.95	P. C.	236,111.70	Wilson Construction Co.—R. G. Rand.
930A	Graham	2.92	Gravel	12,243.00	C. M. Dicus.

STATUS OF FEDERAL AID WORK IN NORTH CAROLINA

Projects Under Construction

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
15	Guilford	4.205	Bit. Mac.	$ 5,441.75	9—1-17	County Commissioners.
61	New Hanover	2.186	P. C.	234,841.39	7-12-20	C. W. Lacy.
69	Transylvania	9.348	W. B. Mac.	231,409.04	3-25-20	Allport & Alexander Construction Co.
125A	Alleghany	4.99	Bit. Mac.	153,899.13	11-22-21	W. E. Graham.

Summary

Type	State		Federal Aid	
	Length	Cost	Length	Cost
WORK UNDER CONTRACT				
P. C.	68.85	$ 2,476,353.35		$
R. C.	8.23	61,002.48		
A. C.	22.25	673,332.01		
T. S.	11.64	114,017.86		
Gravel	2.92	12,243.00		
Grading	.32	9,866.45		
Recon.	9.92	124,060.64		
Bridges		32,898.80		
Sheet piling		13,481.86		
Total	124.13	$ 3,517,256.45		
WORK UNDER CONSTRUCTION				
P. C.	319.42	$ 10,413,688.04	2.19	$ 234,841.39
R. C.	53.40	1,927,582.93		
A. C.	288.19	9,405,622.86		
S. A.	34.46	364,820.00		
Bit Mac.	64.74	1,627,164.92	9.19	159,340.88
W. B. Mac.	149.75	2,706,424.26	8.99	231,409.04
T. S.	348.56	2,742,334.23		
S. C.	110.81	901,008.75		
Gravel	172.78	2,164,950.37		
Graded	238.24	2,049,861.40		
Recon.	22.33	179,000.00		
Cord	2.40	55,818.01		
Bridges		973,696.03		
Total	1,805.08	$ 35,511,971.80	20.37	$ 625,591.31
WORK COMPLETED				
P. C.	65.92	$ 2,420,127.43	25.56	$ 889,940.67
R. C.	38.16	1,278,824.75		
A. C.	99.30	2,741,539.26	42.29	1,521,368.25
S. A.	3.52	121,564.23	22.91	763,048.82
Bit. Mac.	10.40	7,198.07	30.62	798,895.02
W. B. Mac.	.99	22,350.24	19.04	493,880.91
Brick	9.50	217,405.72		
T. S.	126.79	849,098.64	509.18	5,228,132.54
S. C.	44.69	179,646.89	83.90	785,198.22
Gravel	74.22	578,211.16	42.56	488,699.18
Graded	53.29	258,104.32	29.23	252,426.17
Recon.	43.20	81,427.27		
Bridges		385,338.94		651,051.10
Total	569.98	$ 9,140,836.92	806.29	$ 11,872,640.88

Total Roadway Mileage 3,325.85. Total estimated cost of Roadway $58,644,729.43. Total estimated cost of Bridges $2,023,567.93. Corrected to September 1, 1923.

LEGEND

P. C.—*Plain Concrete. R. C.—*Reinforced Concrete. A. C.—*Asphaltic Concrete. S. A.—*Sheet Asphalt. Bit. Mac.—*Bituminous Macadam. W. B. Mac.—*Water Bound Macadam. T. S.—†Top Soil. S. C.—†Sand Clay. Gravel—†Gravel. Graded—†Graded. Recon.—†Reconstruction. Cord.—†Corduroy.

---

* Hard Surface. † "G" Type.

Building Concrete Road on a Large Scale

(Continued from page 4)

throughout the whole job. A tunnel some 200′ long was built, on top of which the sand and gravel is piled. The cars are run into the tunnel and the sand and gravel is loaded into the boxes by gravity hoppers. From the tunnel the cars are taken to the cement shed, where the cement is loaded by hand. The materials are separated in the boxes by vertical partitions.

Grading was begun on September 4, 1922. On October 27, 1922, after a mile of grading had been completed, paving was started. Shortage of material during the Fall, Winter and Spring, combined with bad weather during the Winter and Spring, has cut down the expected progress. However good progress has been made this Summer. On the first of July approximately 12 miles of paving had been completed.

The paving is 6-8-6 plain concrete, 1:1½:3 mix, and a ten bag batch is used. After the rough and fine grading has been done, the sub-grade is rolled to true grade, the forms set, and the grading finished with the sub-grader. The materials are measured in the boxes and hauled to the mixer in 29 car trains. The mixer is charged through a hopper in the top of the drum. The crane lifts the boxes from the train and dumps the materials into the hopper. As the mixer is moved up, the sub-grade is checked with a template, and thoroughly sprinkled. The concrete is discharged from the mixer by a chute. It is struck off and tamped once by the finishing machine, rolled with a Macon roller until no excess water appears, and belted with a canvas bow belt. As soon as possible the finished pavement is covered with canvas covers and kept wet. When hardened sufficiently, the covers are removed and the pavement is diked and ponded for curing. It is cured for 14 days and opened to traffic in 21 days.

The two bridges on the projects are completed. They are of reinforced concrete deck girder types, supported on pre-cast concrete piles. There are eighty-two, thirty and forty-foot piles in the two structures, which were driven with a No. 2 Vulcan steam hammer.

Our biggest day's work is 1100 linear feet of paving. We are now averaging around 800 feet per day. If we can keep this up, the paving should be completed some time in September.

The completion of this project will not come a day too soon, as it is extremely doubtful if the old sand-clay road, which was built of the best local material available, could have been maintained to carry its present day traffic.

P & H Corduroy Grab Bucket Crane Serving Proportioning Bin

On the Famous Corduroy Traction the "Tread" mark of P & H Machines.

Reduces Highway Building Costs

Keeping Materials Off the Subgrade Reduces Labor Costs

Highway departments and contractors have recognized that better results and savings can be made by keeping aggregate off the subgrade. The usual 5 to 10 per cent wastage is eliminated, accurately premeasured sand and stone are carried directly to paver skip, and the number of wheel barrow men and shovelers largely reduced.

P & H Material Handling Cranes provide the fast economical means for filling the proportioning plant bins with the aggregate.

Only one operator is required, fuel expense is low, instant starting and stopping saves time, and on the famous P & H Corduroy Traction they can be maneuvered easily wherever work is to be done.

When not operating with grab bucket the P & H can be used to handle other materials,—may be employed on dragline excavation work,—used for back-filling,—pile-driving or converted to powerful shovel or road-grading skimmer excavator.

The conservative rating on all P & H equipment;—the quality of material, design, and construction;—the integrity and 40-year standing of the P & H organization are reasons why you are safe in investing in P & H Excavator-Cranes.

Excavating Machinery Division

PAWLING & HARNISCHFEGER CO.

Established in 1884

3853 National Ave., Milwaukee, Wis.
LOS ANGLES, SAN FRANCISCO, PORTLAND, SEATTLE

SALES AGENTS:
Tractor & Machinery Sales Company,
1631 W. Broad St., Richmond, Va.

PAWLING & HARNISCHFEGER CO. P & H **GASOLINE SHOVEL**

The Andresen Road Repair Outfit

(PATENTED)

The Andresen Road Repair Outfit is a simplified portable plant for preparing hot asphaltic paving mixtures for repair work.

With this outfit it is possible to keep roads smooth all the time, and by keeping them smooth, reduces the cost of maintenance. With it durable repairs are made the year round immediately after small breaks appear. It embodies every device needed for repair work without requiring the purchase of any auxiliary equipment.

Send for Descriptive Booklet

LITTLEFORD BROS.

453 E. Pearl St., Cincinnati, O.

GROUND STORAGE is the Practical thing *for* ROAD BUILDERS

IT'S the thing that is coming into *wider and wider use* for the storage of construction materials, broken stone, sand, gravel, etc.

Ground storage piles require a minimum of permanent or semi-permanent equipment. You can build them at the railroad siding by a portable belt conveyor or a clamshell rig. You truck your materials to roadside storage and re-load to truck-tractor, truck or car to charge your mixers.

Roadside storage gives you a short haul to your mixer and keeps the material right in sight. If you put your truck in a long haul layout you're going to have the mixerman yanking on the whistle cord all the time.

Trucks get stuck, off the road—and the mixer waits.

The thing that makes this layout practical is the low cost of loading with Haiss Truck Loaders.

Haiss "Creeper" and "Path Digger" Loaders have been so developed that they clean up their own path as they load. They continuonsly "crowd" themselves slowly into the pile while digging. They have the patented Haiss Self-Feeding Device which digs into the pile and pushes the material into the path of the buckets. This action is positive—it does not depend at all on the adhesion of the material.

No hand shoveling—the machine does all the work and with one operator. Loads 1-1½ yards and more of broken stone per minute. Can be equipped with measuring hoppers for batch loading.

The George Haiss Manufacturing Co.
(Inc.)
Canal Place E. 144th St. New York, N. Y.

INVESTIGATE!
Bulletin No. 123 has some real information in it. Ask for a copy.

Tractor & Machinery Sales Co.
1631 W. Broad St. Richmond Va.

"Standard" Paving Asphalt

has been successfully used on some of the most important highway projects in North Carolina.

This asphalt is refined from the straight Mexican asphaltic base petroleum, its purity being over 99.8%. "STANDARD" PAVING ASPHALT meets all the tests of a paving cement for asphalt concrete or sheet asphalt pavement, its uniformity and ability to resist extremes of temperature making it especially suited for these types of construction.

"STANDARD" PAVING ASPHALT has been used in practically every large city in the east.

STANDARD OIL COMPANY
(NEW JERSEY)

Baltimore, Md. Charlotte, N. C. Newark, N. J. Richmond, Va.

REFINERIES: Bayonne, N. J., Baltimore, Md., Charleston, S. C.

Washed and Screened
Sand Gravel Crushed Stone

Conforming to the specifications of the North Carolina State Highway Commission

Prompt shipments by rail or water

Favorable freight rates to all North Carolina points

Quotations gladly furnished on request

THE ARUNDEL CORPORATION

MAIN OFFICE:
Pier 2 Pratt St.
Baltimore, Maryland

BRANCH OFFICE:
519 Board of Trade Bldg.
Norfolk, Virginia

MEN—MACHINERY—CAPACITY

SIXTY PER CENT STATE CONTRACT
ONE HUNDRED PER CENT SERVICE TO ALL

We are saving the State of North Carolina four dollars every working hour in the year!

The same opportunity for saving is yours for the asking!

IT HAS EVER BEEN THE POLICY OF THE EDWARDS & BROUGHTON PRINTING COMPANY TO PROVIDE SUPERIOR EQUIPMENT AND SECURE THE BEST MEN FOR EVERY DEPARTMENT, REALIZING THAT CUSTOMERS ARE ENTITLED TO PROMPT SERVICE, REASONABLE PRICES, AND THE BEST IN MATERIAL AND WORKMANSHIP.

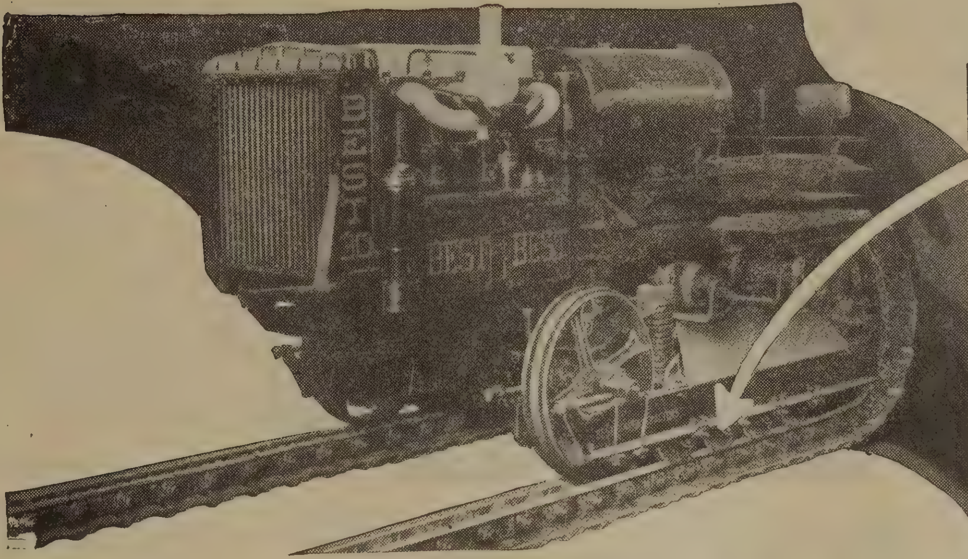
¶ FOR MANY YEARS PREVIOUS TO SEPTEMBER, 1921, WE HAD BEEN ALLOTTED SIXTY PER CENT OR MORE OF THE CONTRACT FOR THE STATE PRINTING AND BINDING, BUT TWO YEARS AGO THIS ALLOTMENT WAS REDUCED TO TWENTY-FIVE PER CENT. IN THE CONTRACT JUST AWARDED WE WERE AGAIN ALLOTTED *SIXTY PER CENT;* BUT WE WISH TO ASSURE ALL OF OUR CUSTOMERS THAT WE ARE PREPARED TO MEET ALL THE PROVISIONS OF THE STATE CONTRACT AND AT THE SAME TIME GIVE UNEXCELLED SERVICE ON PRIVATE ORDERS, AS WE ARE ALWAYS IN POSITION TO INCREASE OUR WORKING FORCE AND EQUIPMENT TO MEET ANY REQUIREMENTS THAT MAY ARISE.

OUR GUARANTY

¶ WE HAVE A COMPETENT FORCE IN EVERY DEPARTMENT AND WILL GUARANTEE TO GIVE OUR CUSTOMERS, NEW AND OLD, PROMPT AND INTELLIGENT SERVICE ON EVERY ORDER WHETHER IT BE A VISITING CARD OR A BOOK.

EDWARDS
& BROUGHTON
PRINTING CO.
RALEIGH, N.C.

CHAS. LEE SMITH, *President*



TRUCK ROLLERS *that* LAST!

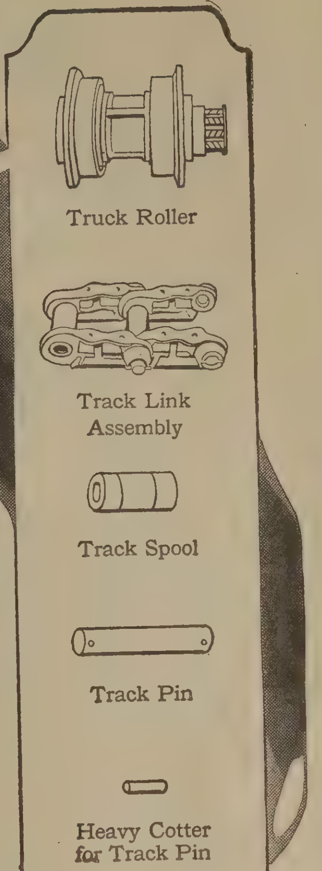
THE DRIVING WHEELS of the most powerful locomotives have forged steel rims.

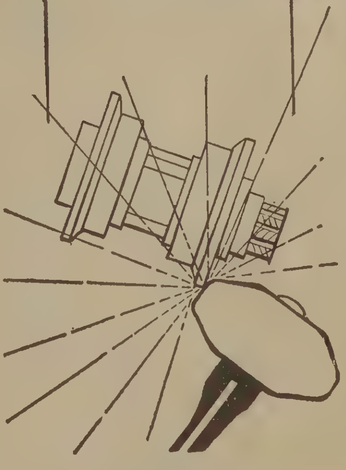
The Truck Rollers of a track type tractor support the weight of the tractor and the flanges of rollers must withstand severe jars and side strains of side hill work and rough going.

On Best Tractors the flanged rims of truck rollers are drop forgings—nothing less—forged into shape under heavy steam hammers, from heated steel of special analysis. After being forged the rims are annealed, bored and reamed, then turned true on the outside tread. They are next shrunk on accurately machined hubs—being hardened at the same time—hardened to resist battering blows just as are the heads of first-class forged hammers or sledges.

The rollers, complete, are mounted on anti-friction bearings to insure easy running, bearings with seals to retain lubricant and to prevent entrance of sand and ruinous grit.

The truck rollers of Best Tractors run over tracks which are true and straight. Tracks are made from drop forged hardened links which have been accurately machined top and bottom and large hardened spools and pins at each joint contribute to the long life which may be expected from the tracks on Best Tractors.





"When Greek meets Greek." Both the sledge and the flanged roller rims are hardened drop forged steel.

E. F. CRAVEN

"The Road Machinery Man"

GREENSBORO, N. C. :-: STATE DISTRIBUTOR

1222-4

BEST TRACTORS

The National Cement

LEHIGH
CEMENT

FOLLOWING closely the natural demand for cement, and offering advantages in the way of service and shipping facilities, are the sixteen great Lehigh mills stretching from coast to coast.

This nation-wide distribution makes Lehigh Cement readily available to practically any locality, thus insuring uniformity of material and prompt delivery to any job. Lehigh's square-deal policy is added assurance of satisfaction in the use of Lehigh—The National Cement.

16 MILLS FROM COAST TO COAST

LEHIGH PORTLAND CEMENT CO.
CHICAGO, ILL. ALLENTOWN, PA. SPOKANE, WASH.

NEW YORK CITY
BUFFALO, N. Y.
MASON CITY, IOWA
MINNEAPOLIS, MINN.
BOSTON, MASS:
OMAHA, NEB.
RICHMOND, VA.
BIRMINGHAM, ALA.
PHILADELPHIA, PA.
KANSAS CITY, MO.
NEW CASTLE, PA.
PITTSBURG, PA.

IN twenty years Portland cement has advanced from comparative insignificance to the leading position in the construction material field. The ready adaptability of Portland cement to every kind of construction, from fence posts on the farm to gigantic dams and highways of endurance; the facility with which it can be handled; its durability which gives the highest degree of permanence, backed up by constant attention to perfection in manufacture and the most intelligent and comprehensive educative and advertising work that has ever been given to any building material, all combine to account for the remarkable progress achieved by the Portland cement industry. We take just pride in having always kept faith with the sound principles followed by this great industry.

Every requirement for the manufacture of the high standard of quality laid down by the established scientific standard specifications is rigidly followed in making Clinchfield Portland cement. Service in the fullest meaning of the word is our watchword in dealing with our customers.

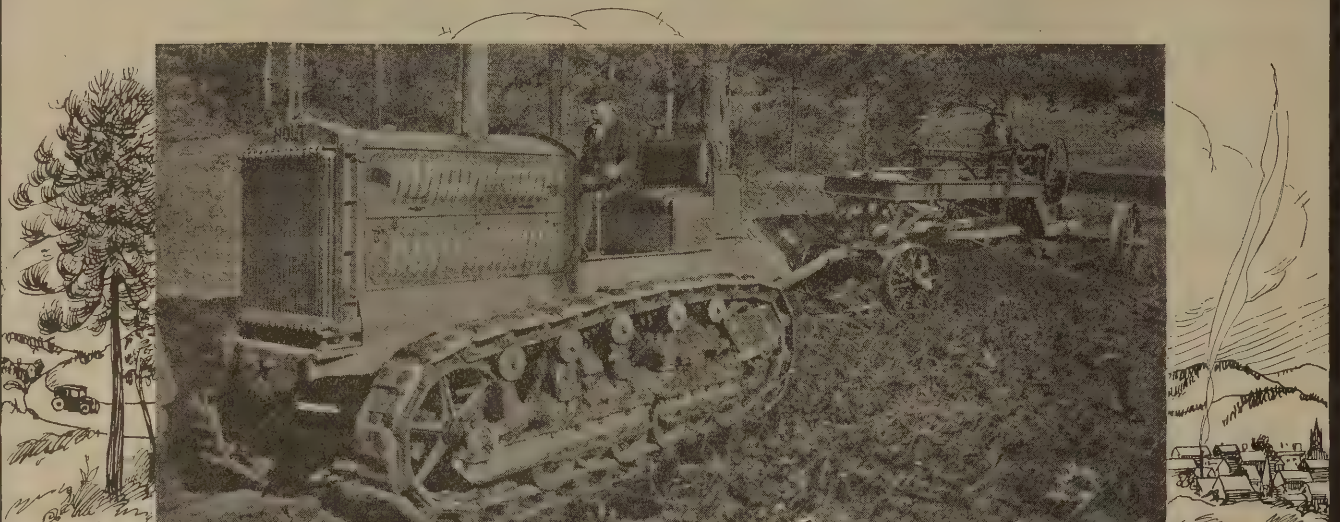
Builded upon this firm foundation of quality and service the Clinchfield plant has steadily grown and expanded and its products have been used with constant satisfaction for all classes of construction work in the South.

CLINCHFIELD PORTLAND CEMENT CORPORATION
Office and Mills: Kingsport, Tennessee

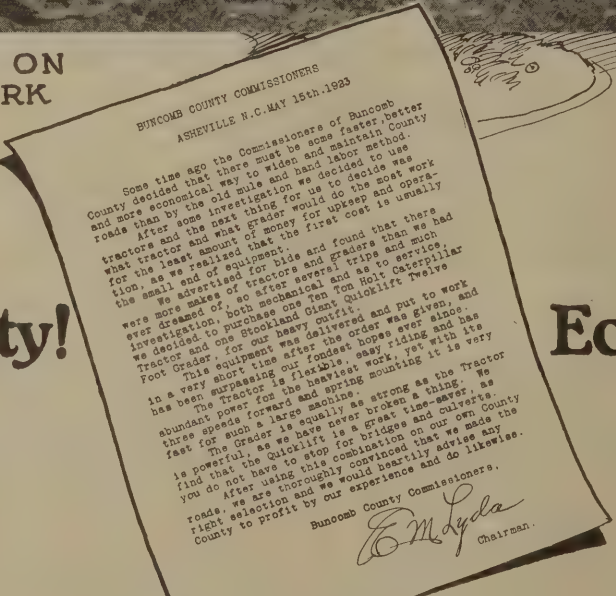
Tractor & Machinery Sales Co.

Distributors

RICHMOND, VIRGINIA



A REAL OUTFIT ON
REAL ROAD WORK



BUNCOMB COUNTY COMMISSIONERS

ASHEVILLE N.C.MAY 15th.1923

Some time ago the Commissioners of Buncomb County decided that there must be some faster,better and more economical way to widen and maintain County roads than by the old mule and hand labor method.

After some investigation we decided to use tractors and the next thing for us to decide was what tractor and what grader would do the most work for the least amount of money for upkeep and operation, as we realized that the first cost is usually the small end of equipment.

We advertised for bids and found that there were more makes of tractors and graders than we had ever dreamed of, so after several trips and much investigation, both mechanical and as to service, we decided to purchase one Ten Ton Holt Caterpillar Tractor and one Stockland Giant Quicklift Twelve Foot Grader, for our heavy outfit.

This equipment was delivered and put to work in a very short time after the order was given, and has been surpassing our fondest hopes ever since.

The Tractor is flexible, easy riding and has abundant power for the heaviest work, yet with its three speeds forward and spring mounting it is very fast for such a large machine.

The Grader is equally as strong as the Tractor is powerful, as we have never broken a thing. We find that the Quicklift is a great time-saver, as you do not have to stop for bridges and culverts.

After using this combination on our own County roads, we are thoroughly convinced that we made the right selection and we would heartily advise any County to profit by our experience and do likewise.

Buncomb County Commissioners,

E M Lyda

Chairman.

Dependability! **Economy!**

Satisfaction!

There's Only One "CATERPILLAR" Holt Builds It

Long Years *of* Life Ahead *of* Them

National Lock-Joint Cast-Iron Pipe

The Pipe *of* Short Units, Long Service *and* Low Costs

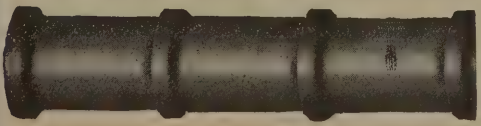
*The Pipe that locks effectively, that prevents Separation
and assures alignment to perfection.*

The pipe which solves culvert renewal problems with least expense, greatest efficiency. The pipe that does not rot or disintegrate, the pipe that is mechanically correct and has proved itself the solution of the culvert problem.

CONTRACTORS *and* ENGINEERS, GET THIS:

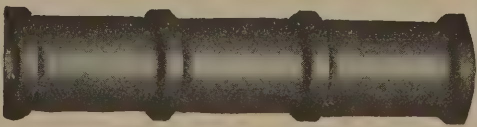
TWO MEN, without the use of any tools whatsoever, will unload, handle and install all sizes up to and including 36 inches in diameter.

It is as cheap to handle and install as clay pipe WITH NO BREAKAGE LOSS. In shallow trench work the entire culvert can be built up, interlocked and rolled into place in one operation.



AMERICAN
CASTING CO.

Birmingham, - - Alabama



CRUSHED STONE

for

CONCRETE PAVEMENT

for

TOPEKA OR WARRENITE SURFACING

for

CONCRETE BRIDGES

for

CONCRETE WORK OF ANY KIND

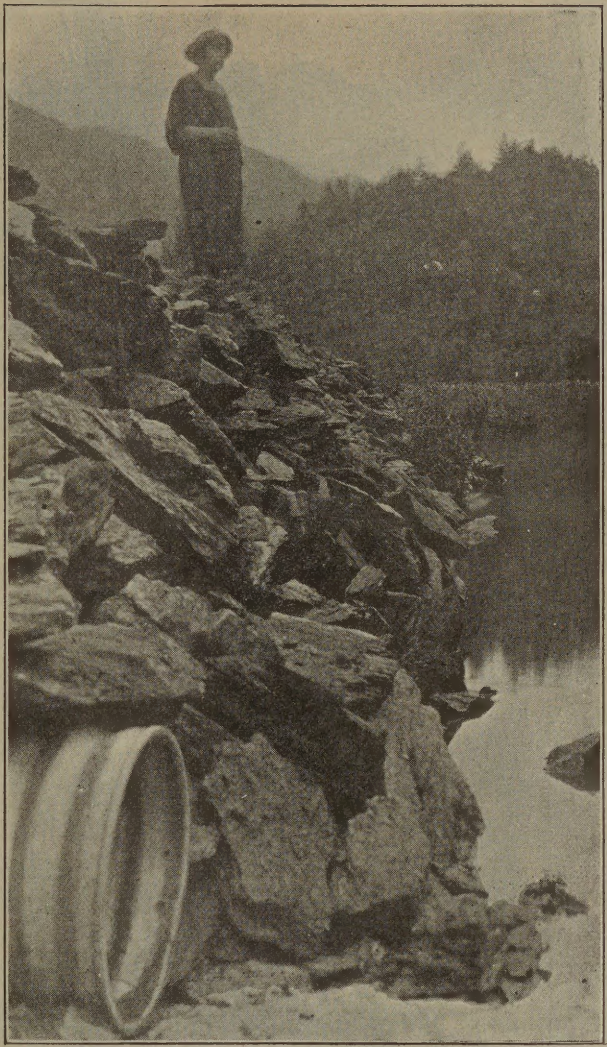
For Delivered Prices in Any Quantity
Wire, Write or Phone

ORINOCO SUPPLY CO.

WINSTON-SALEM, N. C.

Report of Inspection of

A PERMANENT CULVERT



An Armco Culvert Between Lenoir and Blowing Rock, North Carolina.

The rugged strength and elasticity of this Armco Culvert enable it to hold up tons of rock on this mountain road above the clouds.

ARMCO
Resists Rust
Ingot Iron

THE DIXIE CULVERT & METAL COMPANY
ATLANTA, GEORGIA

J. G. BALDWIN,
ASHEVILLE, N. C.

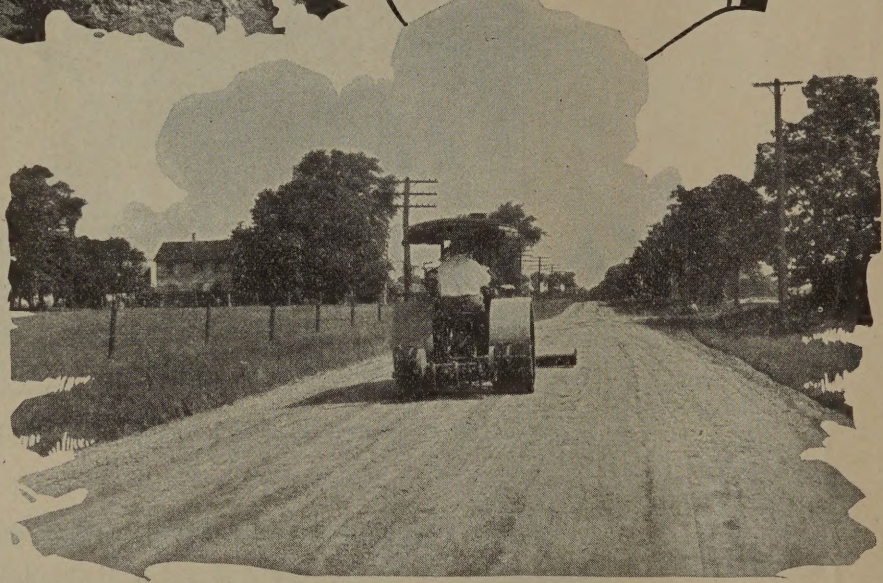
W. H. MCNEILL,
LAKEVIEW, N. C.

ARMCO
Resists Rust
Ingot Iron

The AUSTIN PUP

will do this for YOU

What Other One-Man Machine Could Do It At All?



What Other Outfit at Five Times the Cost Could Do It Any Better?

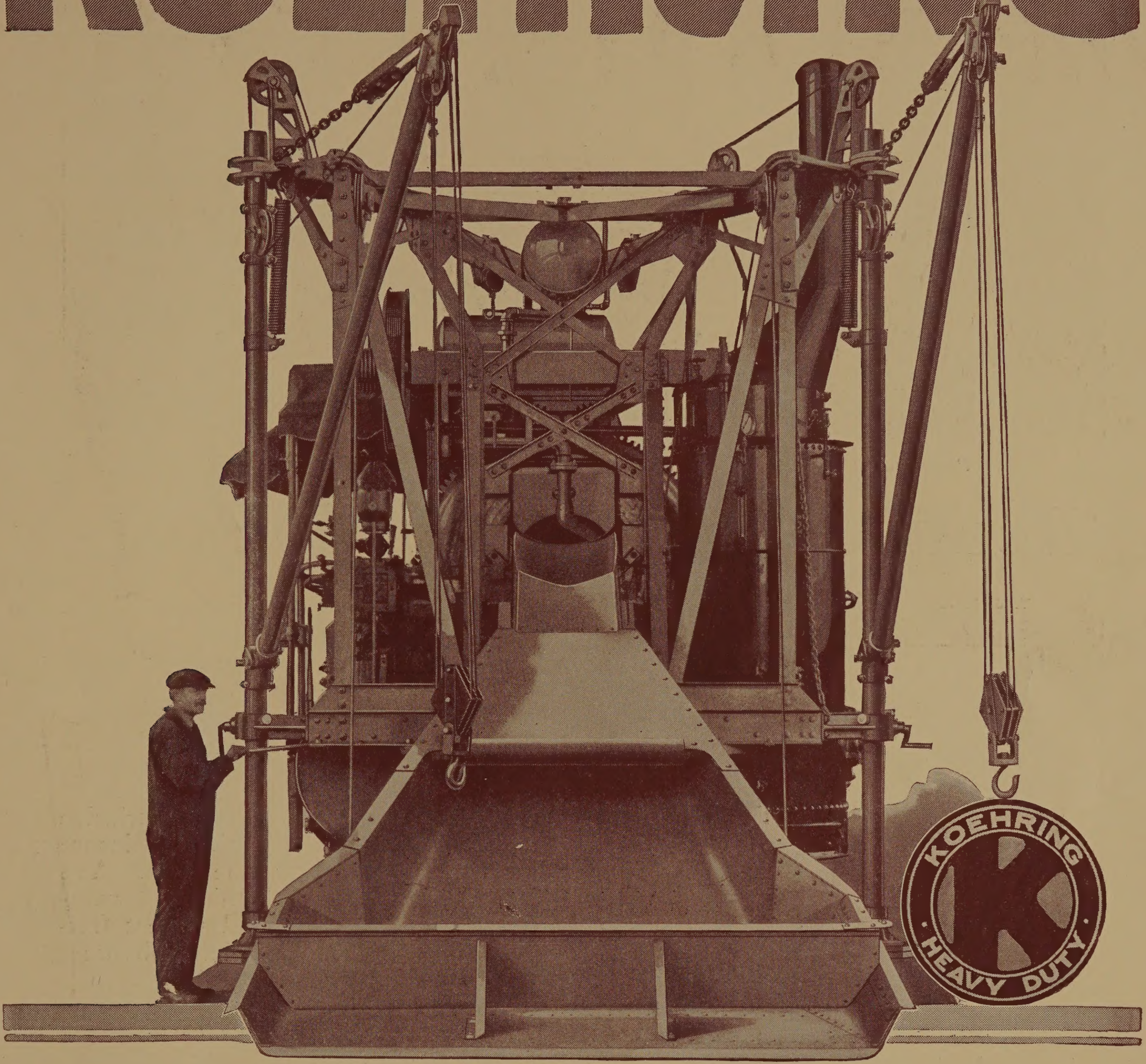
A special catalog tells the whole story of this 3- to 4-ton Road Maintainer and Roller.
Your copy is ready

The Austin-Western Road Machinery Co.

Home Office: Chicago

Richmond, Va. Branch, 12 N. 15th St. Branches in 23 Principal Cities

KOEHRING



Loading End Strains

THINK of strains that the loaded fast-moving skip puts on the mixer frame! How they must tug and twist at the frame! Hundreds of times every working day. Thousands of times every season!

Now look at the Koehring frame construction—how the frame is braced, and re-inforced against strains and stresses from every direction. This is one reason why Koehring driving parts do not get out of alignment and set up unusual wear, breakages and delays. Get this Koehring "Heavy Duty" construction fixed in your mind, and recall it when you think about mixers.

EARNEST BROS.

RICHMOND PHONES
MADISON 6460
MADISON 1381

805 E. FRANKLIN ST.
RICHMOND, VA.

BRANCHES
CHARLOTTE, N. C.
RALEIGH, N. C.

"Earnest Service by Earnest Bros."

KOEHRING CAPACITIES

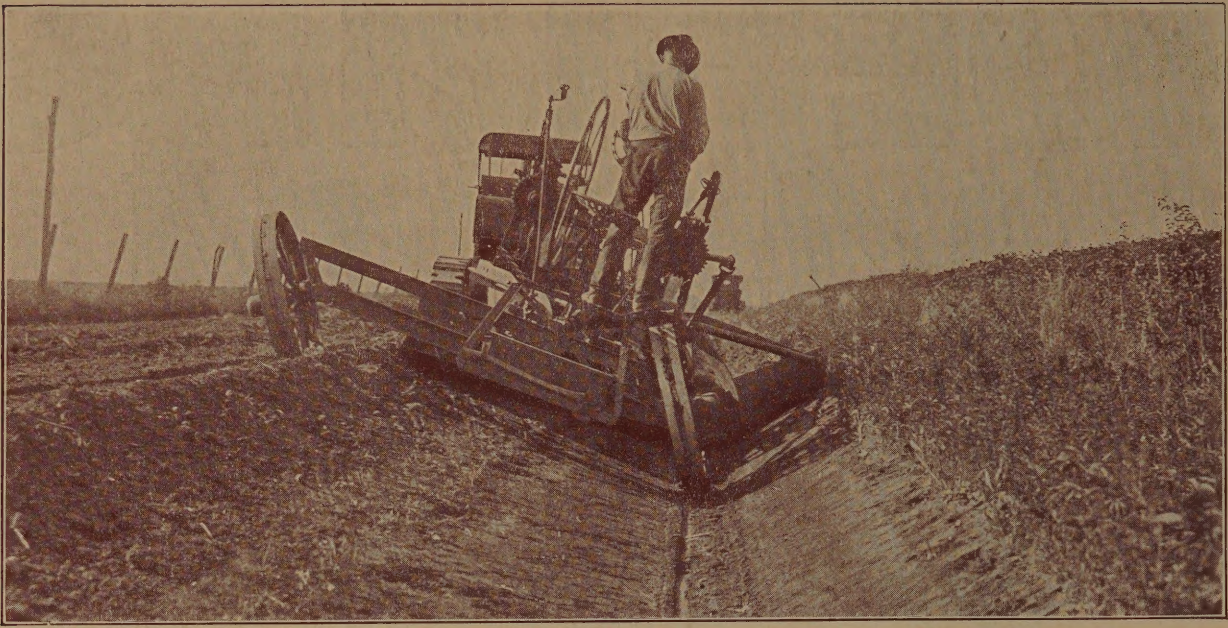
Pavers: 7, 10, 14, 21, 32 cu. ft. capacities mixed concrete steam and gasoline. Write for catalog P-19.

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline. Write for catalog C-19.

Dandie: A light staunch mixer for footings, culverts, foundations, etc. 4 and 7 cu. ft. mixed concrete, steam and gasoline. Power charging skip, low charging platform batch hopper, light duty hoist. Write for catalog D-19 Rubber tires optional.

OTHER PRODUCTS:

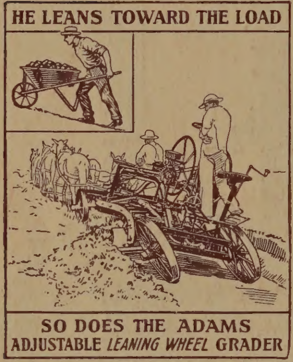
Koehring Cranes and Shovels
Blaw Knox–Forms
Turntables
Bins and Batchers
Clamshell Buckets
C. H. & E. Pumps
PARSONS Excavators
JEFFERY Loaders



Perfect back-sloped, flat-bottom ditch cut by Adams Grader with Back-Sloper Attachment

Reduce Your Grading Costs

Trade Mark

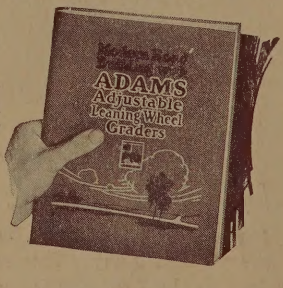

HE LEANS TOWARD THE LOAD
SO DOES THE ADAMS ADJUSTABLE *LEANING WHEEL* GRADER

Reg. U. S. Pat. Office

YOU can build better roads and do more work per dollar or per day with an Adams Adjustable Leaning Wheel Grader than with any other. That's not an idle boast but an actual fact—proved by Highway Officials and Road Contractors all over the country, and backed by a guarantee which is the result of nearly thirty years' experience building and selling road machinery.

It's all due to the Adjustable Leaning wheels—an exclusive feature of Adams Graders. They prevent skidding, insure perfect control, increase capacity, and lessen the draft. And they enable Adams Graders to cut down side hills, fill washouts, build sub-grades to specifications, build perfect flat-bottomed, back-sloped ditches, handle many difficult jobs other graders cannot do—and do it all cheaper and better than other machines or methods

Let us show you what other North Carolina highway officials and road contractors are doing and saving with Adams Graders. Mail the coupon for this catalogue.



J. C. BENJAMIN -- RALEIGH. N. C.

Office and warehouse, 733 W. Hargett Street

Distributors for J. D. ADAMS & CO., Indianapolis, Indiana.

Adams Graders are built in 6½. 7. 8. 10 and 12 ft. blade lengths.

The Adams line also includes: Scarifier-Graders. Scarifiers: Road Maintainers, Road Patrols Drags, Plows Scrapers, Etc.

Machines and Parts in stock at Raleigh

ADAMS
Adjustable Leaning Wheel
GRADERS

J. C. BENJAMIN.
733 W. HARGETT STR.,
RALEIGH. N. C.

PLEASE SEND ME THE ADAMS CATALOGUE AND EXPLAIN HOW ADAMS GRADERS REDUCE GRADING COSTS.

NAME____________________

POSITION____________________

ADDRESS____________________

TOWN____________________ STATE__________